In This Issue—*Can We Use Lighter Metals?*

MOTOR AGE

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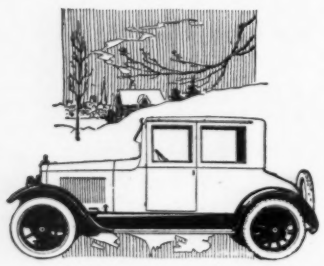

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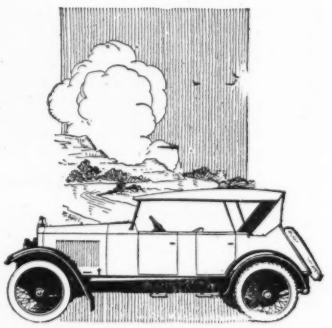
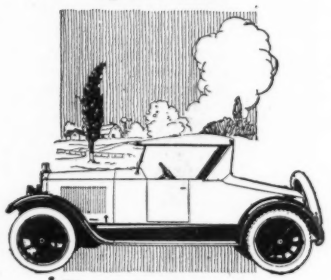
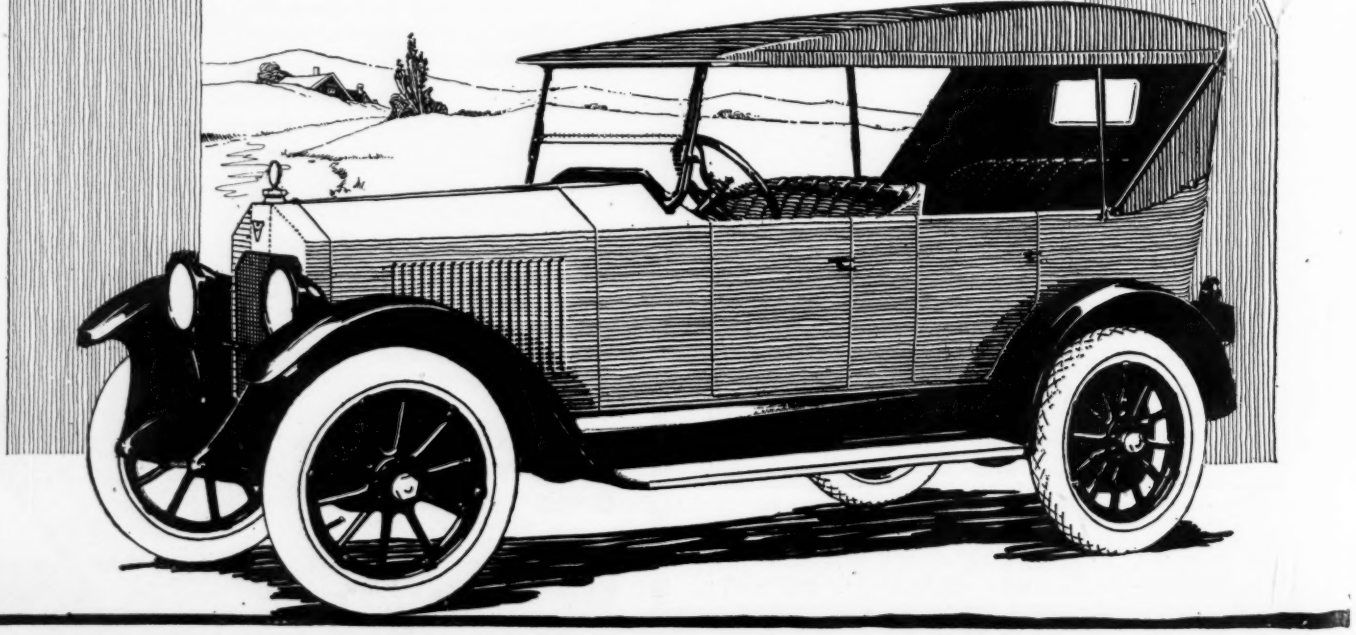


Four-passenger
Sport Car



Two-passenger
Touring Roadster



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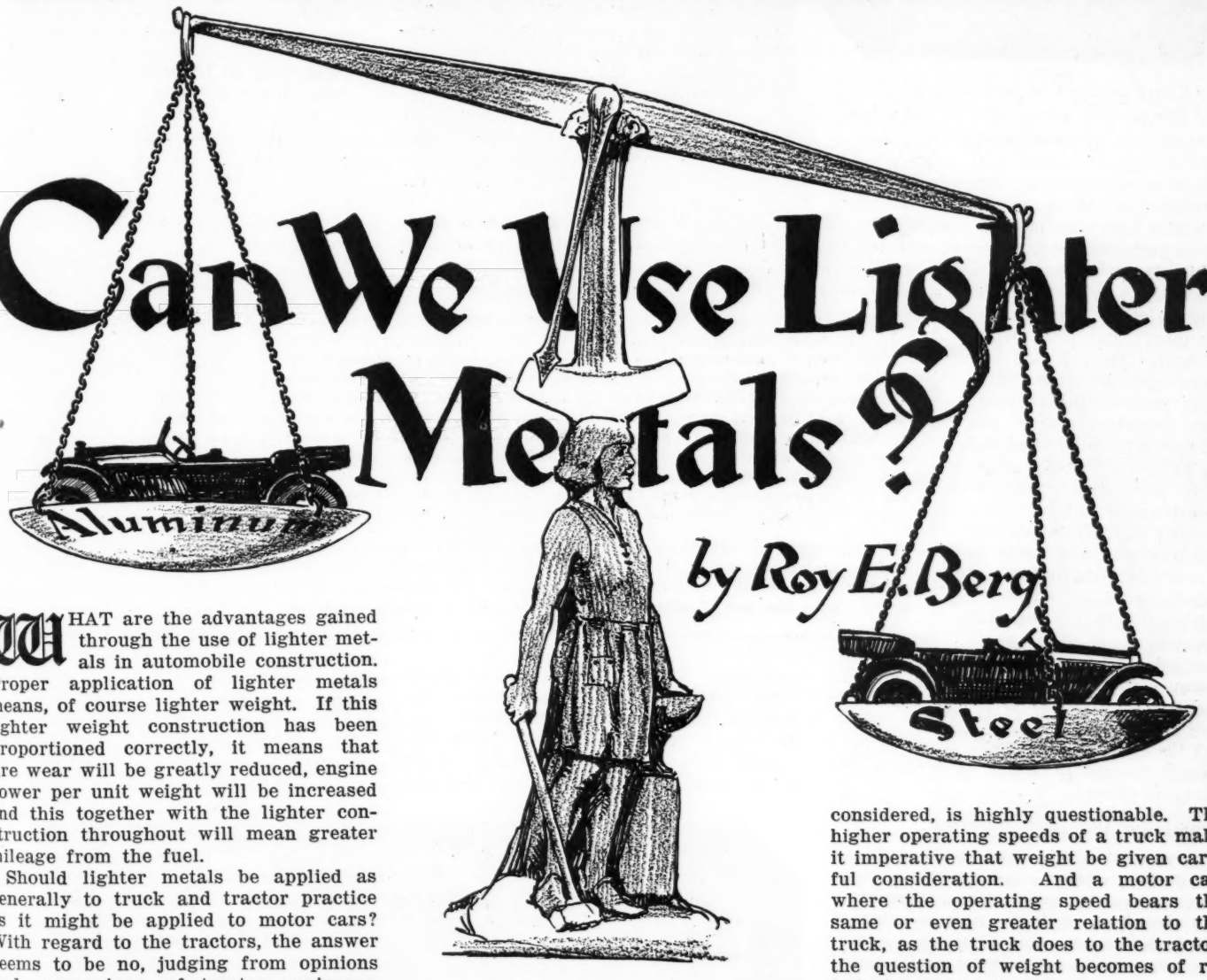
MOTOR AGE

Can We Use Lighter Metals?



by Roy E. Berg

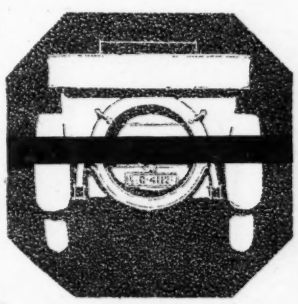
WHAT are the advantages gained through the use of lighter metals in automobile construction. Proper application of lighter metals means, of course lighter weight. If this lighter weight construction has been proportioned correctly, it means that tire wear will be greatly reduced, engine power per unit weight will be increased and this together with the lighter construction throughout will mean greater mileage from the fuel.

Should lighter metals be applied as generally to truck and tractor practice as it might be applied to motor cars? With regard to the tractors, the answer seems to be no, judging from opinions and expressions of tractor engineers. The following paragraph from the tractor trend story which appeared recently in MOTOR AGE is quoted:

Advantage of Weight in Tractors

"Just how much the future of the tractor engine business is going to be affected by the use of the aluminum alloys, we can not say. Light weight is after all not the prime requirement in tractor practice. Acceleration is not so essential as is plain, stubborn, brute strength, that can outlast any day's work. In a motor car where acceleration is a prime requisite, extra weight is burdensome baggage, that requires excessive power to speed it up. In a tractor, properly applied weight means so much strength, and while it represents a potential junk value, that skillful design could materially decrease, still there is a good reason for the weight.

We may rest comfortably assured that the greatest applications of light weight metals are not to be made to the tractor, but whether this is so when trucks are considered, is highly questionable. The higher operating speeds of a truck make it imperative that weight be given careful consideration. And a motor car, where the operating speed bears the same or even greater relation to the truck, as the truck does to the tractor, the question of weight becomes of relatively greater importance.

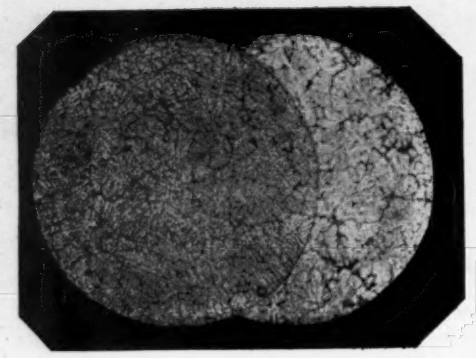


When is a pound not a pound? Ans. When it is unsprung weight. The weight below the heavy line is unsprung weight and above, sprung weight

Weight in a car is of two kinds. One is unsprung weight and the other is sprung weight. The unsprung weight includes all those parts carried below the springs, such as wheels, rims, axle, half the weight of the propeller shaft and part of the spring weight.

Meaning of Unsprung Weight

We often hear people discuss the relative riding abilities of their machines and terms such as sprung and unsprung weight pass idly through the air, with little or no understanding and appreciation of what the terms mean. Let us take two weights one a 100 lb. weight and the other a 10 lb. weight separated by a spring, secured rigidly to each weight. Now if the 10 lb. weight were struck a blow sufficiently heavy to move it, say 10 in., the 100 lb. weight being ten times the heavier, would move only 1 in.



Cross sections of two castings. The fine grain is aluminum and the other cast iron

Now if we reverse the operation and strike the 100 lb. weight a blow sufficiently heavy to move it 10 in., the 10 lb. weight would then be moved 100 in. This is merely an elementary way to consider the relation between the sprung and unsprung weight. In practice our cars are so constructed that the relation of these two weights ranges between 3.75 to 1 and 4.5 to 1.

If our cars were so constructed that the weight carried below the springs was negligible in amount, the roughest roads could be traversed without the slightest movement of the parts carried above the springs, because there would then be no momentum to transfer from the road gear to the chassis.

This is where the application of light weight metals is going to produce the greatest effect.

Aluminum the Best Material

In regard to the metals to be used for this lighter weight construction, it seems that from all appearances, aluminum and its alloys offer the best solution of the problem. A table of specific gravities is given herewith. The metals listed with one exception are those used most extensively in motor car construction. Magnesium is listed not because it is used extensively but because a certain company is a strong advocate of magnesium pistons. Magnesium is one of the lightest metals known to man that has any commercial practicability. Its use would cut down weight tremendously for it weighs but one-sixth that of steel. The chief objection to its use, in the past, has been its low tensile strength.

Aluminum alloys have been made recently, where the strength of the aluminum forging runs as high as 70,000 lb. per sq. in. A good carbon steel will run in the neighborhood of 100,000 lb. per sq. in., so on the basis of strength for strength an aluminum part need be only a little larger in size and its weight will be about one-third that of steel.

The present application of aluminum is confined to the following parts: Crankcase (upper and lower section), engine block, pistons, fan pulley, fan and blades, clutch, clutch housing, transmission housing, propeller shaft, rear axle housings, radiator shells, water pump housings, steering gear wheel spider, and the bodies. This list is probably not complete in detail and entirety but it shows the parts that are commonly made of aluminum alloys in present day practice.

How many more parts will be added to this list we can not say with certainty. It is a fact that there are experimental cars running to-day with aluminum front axles, the axle weighing about 35 lbs. Aluminum connecting rods operating directly on the wrist pin and crank pin without bearing metals or bronze backing are not idle dreams, but actualities. Cars are in operation where the axle-shafts are of aluminum.

Aluminum disk wheels are now being offered by one aluminum producing company. These wheels are extremely light. They will effect a tremendous reduction in unsprung weight. Their general use does not seem improbable. For trucks these aluminum wheels work even greater reductions in unsprung weight than in passenger car service.

How much further will this application proceed? Price, of course, will determine this to a large extent. But if the price of this light metal declines as a result of better production methods, its use will soon be applied to parts, where steel now seems to be the only possible metal to use.

At present there is one tendency in engine construction that lighter metals will undoubtedly discourage, providing prices adjust themselves. This tendency is the increasing use of engine cylinders cast in unit with the upper part of the crankcase.

The wide use of aluminum need not be discouraged. Aluminum has proved itself. Louis Chevrolet, the famous race driver and exponent of aluminum, developed the Frontenac cars and these cars achieved wonders on the track. One of the Frontenacs won at Chicago, some years back, and in every race they have been entered, they have always been contenders.

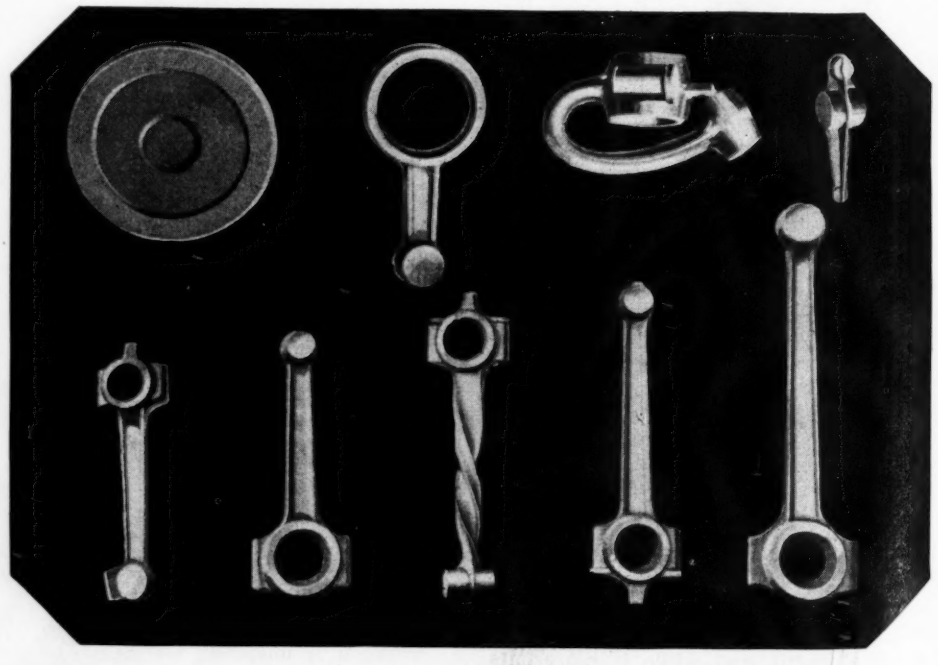
The Frontenac cars are marvels of

TABLE OF SPECIFIC GRAVITIES

Metal	*Specific Gravity*
Magnesium	1.69 to 1.75
Aluminum	2.56 to 2.71
Iron	7.4 to 7.9
Steel	7.6 to 7.93
Brass	7.8 to 8.6
Bronze	8.52 to 8.96
Copper	8.62 to 8.92
Lead	11.07 to 11.44

EDITOR'S NOTE—*When several companies individually capitalized at sums ranging way up in the millions of dollars, represented by the best engineering talent in the country, begin to devote their serious thought to the greater use of aluminum alloys in the automotive industry, it is high time to sit up and take notice of what is being done with this light metal. Gasoline consumption, tire mleage, acceleraton, horsepower per unit weight of the car, all will be greatly increased. The latter feature adds to the ability of a car to negotiate hills on high gear. With the increasing costs of everything pertaining to the operation of a motor car, these are all important considerations, and become more and more important as the costs rise.*

In this story the accomplishments through the application of light weight metals to the automotive industry are discussed. The important thing, to the dealer, is the effect upon his ability to render service with the use of aluminum, and this subject is also discussed



A few parts that are being made from aluminum. These parts are forged in the same manner that steel is forged. Rods, when made in this manner need no bearing metal or bronze backings, the metal of the rod taking all the wear

aluminum construction. They weigh about 1600 lb., and judging by the success that these cars have obtained, we must concede that light weight construction has real merit behind it.

The manufacture of cars of aluminum is easy to talk about, but we must not forget that manufacturing the car is only about half of the problem. The service man contends with the other half.

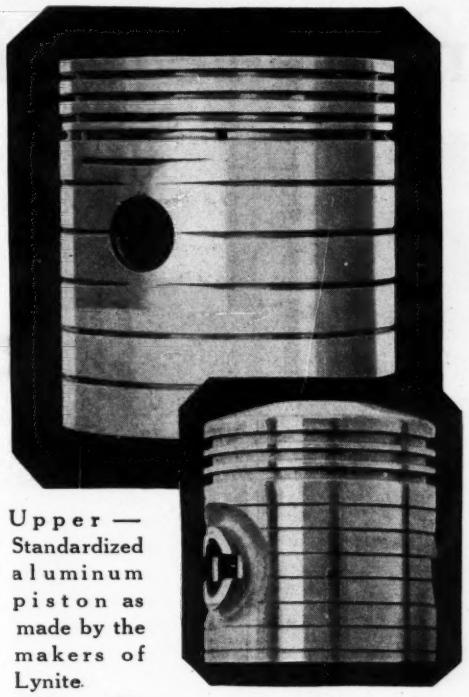
Will the general use of aluminum facilitate maintenance? The answer seems to be yes. A neat operation was witnessed recently where one man, with the aid of a light portable crane, removed an aluminum engine from a car without any trouble. The time was just a little longer than it would have taken two men with the aid of a large heavy cumbersome crane, to remove an engine of similar size, but made of iron. The saving to the car owner was at the rate of $1.25 per hour. The ease with which one man could handle a 35 lb. front axle is not difficult to visualize.

Difficulties Encountered

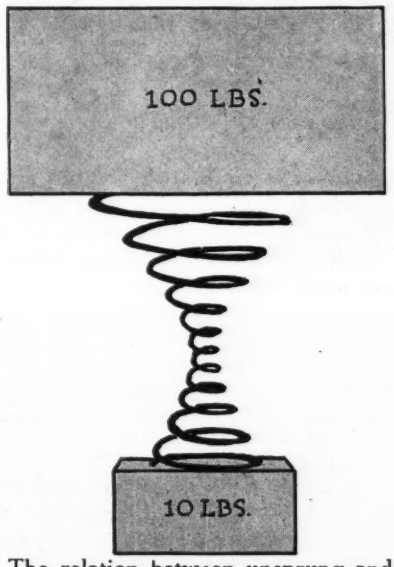
One thing is certain, that before a general use of aluminum is made, the service man must be sold to its worth. At present there is a good deal of mistrust amongst service men regarding aluminum and this is particularly true of aluminum pistons. When we face the facts, it must be admitted that the use of aluminum pistons at their first inception, occasioned a good deal of grief. Why? This is extremely hard to say. Aluminum expands about twice as much as iron, per unit of heat. Naturally, therefore, it was necessary to allow about twice as much clearance for the expansion of the piston. Now when the engine was started from a cold start, the pistons would warm up very rapidly and thus the pistons would fit the bore in a very snug manner. However, this warming up process did take some time, and during the interval that elapsed the combustion chamber would be filled up with oil to the point where the spark plugs would become fouled.

This effect of oil pumping has caused the feeling of distrust amongst service men, that now exists so strongly. In an attempt to remedy the oil pumping trouble, many service men recommended iron pistons, fitted to iron piston clearances and weighing twice as much as the original aluminum pistons. This practice is all right as far as overcoming the oil pumping difficulties go, but it is all wrong as far as the engine bearings are concerned. A few hundred miles travel with an installation of this kind will result in a set of bearings that are all pounded to pieces.

These oil pumping difficulties are gradually being overcome, as more is learned about piston construction from this metal. New aluminum alloys are being made for piston work that expand very little as they become heated, which makes it possible to fit the pistons to much closer limits. One manufacturer claims that he has developed a piston metal that when made up into a piston for a 4 in. bore will expand about 0.001 in., from cold to the temperature obtained within the engine.



Upper — Standardized aluminum piston as made by the makers of Lynite. Below—The aluminum piston used in Liberty engine

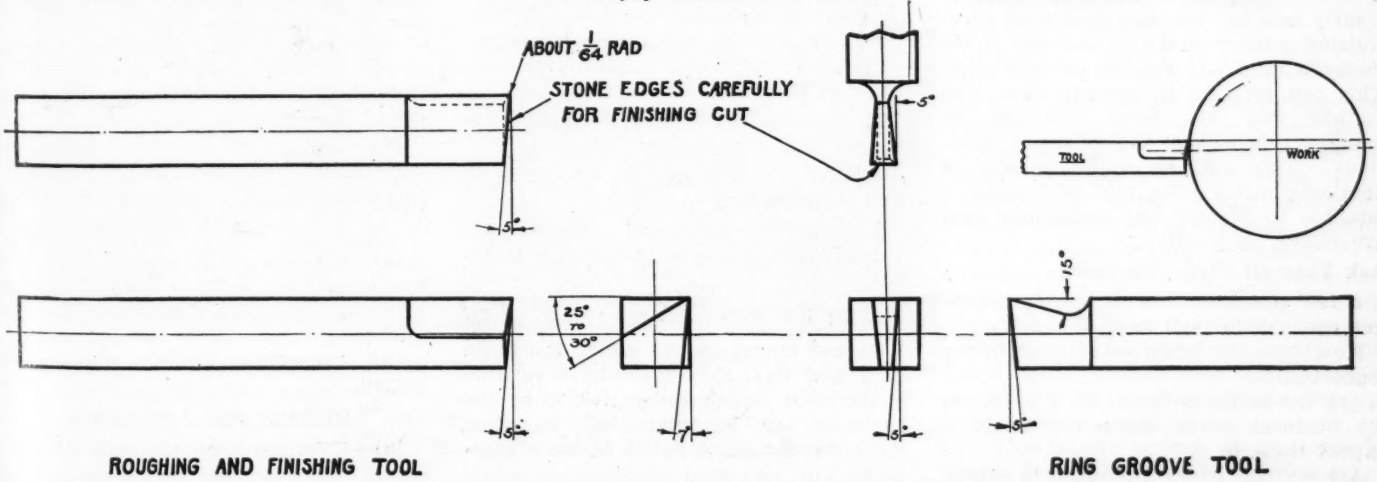


The relation between unsprung and sprung weight is as the above illustration shows, though not representative of any particular ratio in use

Welding Aluminum

The problems for the service man to solve after this metal becomes more widely used are those of repair. The difficulty of welding a broken aluminum crankcase, is being made more and more simple. Every day announcements are being made of solders and welding metals that will enable the mechanic to weld a broken aluminum crankcase in short order and with little expense.

There has always been some little trouble attendant with the cutting and turning of parts out on a lathe, because if a piston for example is to be turned down a few thousandths, the result would generally be a ruined piston. To eliminate the difficulty of the tool tearing the piston when taking a cut, the tool should be ground as the illustration shows. The cutting edge of the tool must be carefully stoned and should be so ground that the flat part will be slightly wider than the cut to be taken, which should not be over 0.02 in. per revolution. A good compound to be used for lubrication of the cutting edge can be made from 70 parts kerosene and 30 parts lard oil.



How to grind the tool for cutting aluminum. A carefully whetted edge is necessary to assure a smooth surface. When so finished a surface can be cut as smooth as if polished with emery and oil

Finding the Hidden Pro

Fig. 1.—The Shop Office—The orders for repairs are received at this office. The foreman and the customer can decide on best methods to repair job. This makes better satisfied customers and eliminates second-hand information where you have a general office man to take the job. All work is scheduled from this office, also all time records are made here

WE cannot resist the conviction that the reason for so many confusions surrounding the management of the automobile repair shop is that the principles of scheduling have not been fully appreciated or used. Every useful scheduling plan that has been successfully used by manufacturers that can be applied to the garage should be used. How many struggling enterprises would gain a solid underpinning if the operators would practice business analysis?

It is clearly apparent that it pays to clearly face our business in a most scrutinizing manner, make an analysis of the methods used and results accomplished. This can be done in several ways, one method that has been employed by managers is to ask the business questions. This will be found helpful in obtaining information that will make it possible to remedy any conditions that are eating up profits.

Ask Yourself These Questions

A few questions that any garage manager can ask himself are:

How does the business respond to my leadership?

Are the methods by which I carry on my business really doing the things I expect them to do?

Are my customers interested in scheduling methods in the repair shop? Are they satisfied with my methods of shop control, such as charges for labor material, supervision of workmen and promises that are made on work delivery?

What are the most effective methods to secure (a) productive labor in the shop; (b) storeroom control; (c) satisfied customers?

Do I know how many promises have been made for finished jobs and the exact time they were promised for to-day's business?

How many jobs are in the shop to-day for repairs?

How many chargeable hours do my men put in each day?

How many non-chargeable hours?

Do I get the benefit from a full day's work in the shop?

How much do I lose by workmen coming in late and padded job costs?

What profit each day do I make from each man employed?

How much stock and supplies are wasted each day by careless shop methods?

Modern Business Methods

Garage managers are seeing the dawn of a new day, they must have reliable methods by which the activities of the business can be controlled. In view, therefore, a definite policy in the organization of a shop should be established. To do this certain established the methods employed to carry on our business. Effective control of a shop

EDITOR'S NOTE: Analyze your business! Find the leaks that take away your profit! Ask yourself the questions on this page—one by one—stop and think how each question pertains to your garage or service station. You

may be secured through the following essentials.

ORGANIZATION

(a) Type of organization, the dividing of the business into department, department control.

PROMISE OF WORK

(a) In taking a job, make a reasonably close promise when work can be delivered (scheduling job through shop). Receive an order and give estimated cost. All work must be standardized when possible.

(b) It should involve methods to assign work to the shop in the most effective manner.

(c) A method should be employed to present a graphical record of every job received in the shop and the time it is promised for delivery.

TIME RECORDS—LABOR AND DELIVERY

(a) To provide suitable job and cost records that will absolutely guarantee to customer and to the business an accurate charge for all cost activities pertaining to the job.

(b) The plan should relieve the mechanic from all clerical work.

(c) The starting and stopping time of the men in the shop be controlled and recorded by standard methods.

STORES RECORDS—MATERIAL USED AND MATERIAL TO BE ORDERED

(a) All stores and supplies should be controlled so that they can be issued only when receiving cash or being charged to the customer when received.

(b) A perpetual stock inventory should be kept of stores. This includes gas, oil and grease.

(c) Methods of controlling the use of oil, grease, gasoline, waste, etc., in the shop, and service station, must be provided.

(d) Methods of ordering and receiving stock are necessary.

COST RECORD—COMBINATION OF TIME AND STORES

(a) All charges of material, supplies and labor should be so made that when work is completed, an invoice can immediately be issued to the customer.

(b) Proper pay methods must be employed.

REPAIR SHOP CONTROL

(a) Effective shop methods are necessary for storing cars for repairs, washing, polishing, cleaning parts, scrap storage, return shipments of guaranteed parts to manufacturers, bench ar-

fits in Your Repair Shop

are selling service, and satisfaction is the first requirement in the sale of service. The customer won't be satisfied if there is over-charging or delayed delivery through lack of system in the service station.

rangement, tools and their care, light, heat, drinking water, fire protection, lockers and wash room.

(b) Effective methods of storing cars and collecting for same are required.

(c) Methods of educating the mechanician in better workmanship and more efficient labor should be developed, including an apprentice system.

Not all of these essentials can be incorporated in every garage, but some of them can be applied. If jobs are to be effectively controlled a place must be provided where records can be made and the activities of the shop carried on.

Shop Foreman's Office

An office for the use of the shop foreman, with the facilities for scheduling the work, is one of the important essentials of effective service station control. In Fig. 1 is shown a general view of a type of office installed for shop foreman. This office is about 10 ft. by 12 ft. by 8 ft. high; distance from floor to glass, 4 ft. The time-clock, work order card case, schedulegraph, desk and telephones are all located here. This gives a central point in the shop for transacting such shop business as may come up.

In choosing the location it should be made with the idea of its convenience to customer and shop men. All orders for repairs are received at this office, the customer and the shop foreman review the car troubles. This gives the shop first hand information, and also permits the customer to come directly in contact with the man who sees to the repairs on his car.

When we recognize the many important conditions entering into a service or repair job there is good reason to see why objection arises so often over work performed and the price charge for labor and material. The customer is individually interested in his own job, while the shop superintendent should be vitally interested in several. Poor instructions are one of the many faults of the present method of taking a job for repair. If you can get the customer and the shop superintendent to discuss the repair problem you have to some extent eliminated chances for mistakes.

CUSTOMERS MUST BE RETAINED BY REASON OF GOOD SERVICE

They are too often disappointed in promises that are made on delivery. The foreman of the shop without suitable records and effective scheduling control is handicapped in stating when work should be completed. Without records of jobs in the shop he must rely on "guesses" for delivery. The garage who will take advantage of the principle of scheduling can eliminate all uncertainty as to promises of finished work. There are several very simple methods that may be employed, the use of a blackboard making entries of all jobs record with dates promised is a plan that can be used very successfully. To make your scheduling plan a positive check on delivery and time requirements the schedulegraph as shown in Fig. 2 will be found helpful.

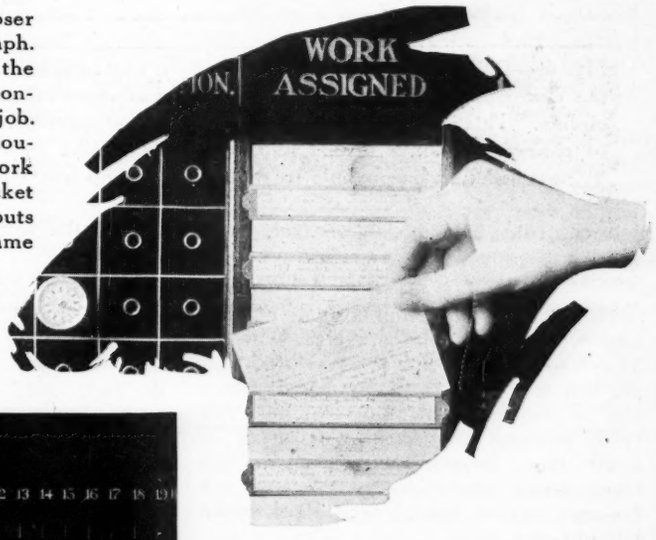


Fig. 3—This is a closer view of the schedulegraph. It shows more clearly the arrangement of the controlling factors of a job. Notice the scheduling coupon in the holder, the work order card in the pocket back of coupon, this puts the two cards on the same job file. File headings, time strips and hour and onehalf lines are more clearly defined

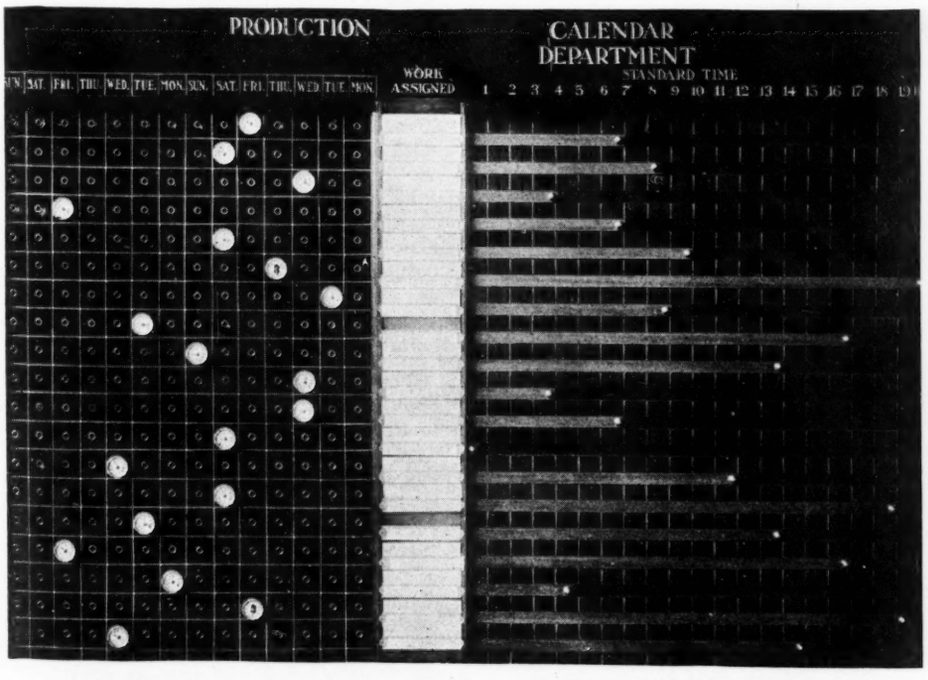
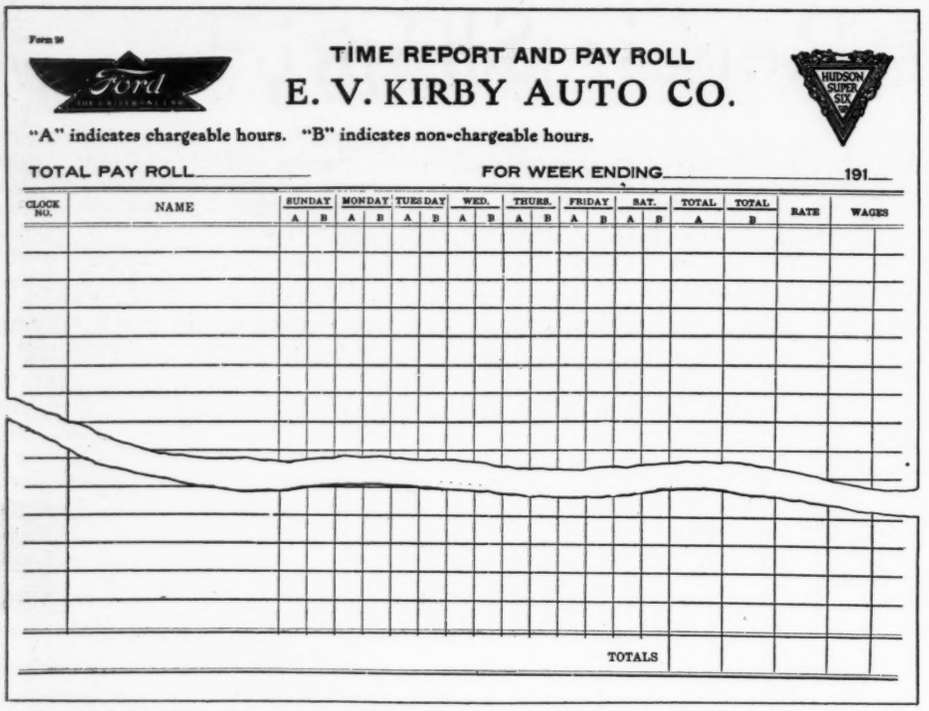


Fig. 2.—The scheduling calendar is placed in the shop office. The foreman can make more accurate promises by using this scheduled plan. Delivery control is more certain, each job in the shop with the time required to do the job, time of promised delivery and to whom the job belongs is graphically shown. The standard time strip and the delivery plugs with the clock face give in a clear, concise way the most important items pertaining to the job. This graphical schedule is simple but effective and extremely helpful to the men in the shop

Scheduling the Job

With this method of presenting graphically the activities of a repair shop the foreman can control the shop with much more precision. Promises can be made with some certainty and confusion of shop control eliminated. A control of this kind will give command of shop activities. The time and delivery record of each job is clearly shown, an eye is pointing directly to every job in the shop. No bad promises and the elimination of padded time cards are possible when adopting a scheduling plan which is graphically shown.

The schedulegraph used in this plan was 3 ft. 6 in. by 5 ft. 6 in., and is for a 20-job control. Different sizes can be made in unts of 10, 20, 30, 40, and 50-



Form 16

Ford

TIME REPORT AND PAY ROLL

E. V. KIRBY AUTO CO.

HUDSON SUPER SIX

"A" indicates chargeable hours. "B" indicates non-chargeable hours.

TOTAL PAY ROLL_____ FOR WEEK ENDING_____ 191__

CLOCK NO.	NAME	SUNDAY A	SUNDAY B	MONDAY A	MONDAY B	TUESDAY A	TUESDAY B	WED. A	WED. B	THURS. A	THURS. B	FRIDAY A	FRIDAY B	SAT. A	SAT. B	TOTAL A	TOTAL B	RATE	WAGES
	TOTALS																		

Fig. 4.—Daily Labor Report—Receiving a record from the shop each day as to the chargeable and non-chargeable labor has some influence on better shop discipline. This is balanced each week showing amount paid to worker and amount of chargeable hours turned in by workers. With information of this kind it should be possible to reduce your shop losses to a minimum

job control. The 20-job control, however, is the most popular size for garage service.

The main construction is made of steel and wood; the time strips are wood. They are designed to work freely so that adjustments (to show standard time) can be made without much trouble. The card holders are hardwood, using a brass label holder for job card; the clock plugs for delivery promises are die-cast. These are furnished for every job file.

To make each function of the schedulegraph a distinctive feature different colors are employed. The time strips are bright red. They cover up a file of green. The spaces between the time strips are white. The hour and half-hour lines are alternately red and green. This gives a contrast that makes each item of control distinctly individual.

Arranged to Individual Needs

One of the advantages of this means of controlling the scheduling of jobs is the simple manner in which the schedulegraph can be arranged to suit the different problems found in garages. The schedulegraph is supplemented with a work order card and coupon, this is the only printed form used in connection with the plan.

It is not necessary to have a time clock to stamp the cards, time entries can be made by the workman or foreman with a pencil. In receiving a job from a customer the work order card and coupon is filled out by the foreman or serving clerk. The coupon is placed in the schedulegraph in the small holder, the work order card is left with the job.

In placing the coupon in the schedulegraph the estimated time required to do the job is entered in the board by pulling out the red time strips. This is shown as seven hours on the first job listed. To make a clear record of what time the job has been promised small clock plugs are used, being entered on what day in this or next week the job is to be finished, the time of day being shown by the small hand on the clock. The use of these clock plugs is shown in Figs. 2 and 3, a promise of delivery being shown on every job entered on the schedulegraph. The job is in the shop.

IF YOU ARE A SERVICE MANAGER ASK YOURSELF THESE QUESTIONS

¶ How does the business respond to my leadership?

¶ Are the methods by which I carry on my business really doing the things I expect them to do?

¶ Are my customers interested in scheduling methods in the repair shop? Are they satisfied with my methods of shop control, such as charges for labor material, supervision of workmen and promises that are made on work delivery?

¶ What are the most effective methods to secure (a) productive labor in the shop; (b) storeroom control; (c) satisfied customers?

¶ Do I know how many promises have been made for finishing jobs and the exact time they were promised for to-day's business?

¶ How many jobs are in the shop today for repairs?

¶ How many chargeable hours do my men put in each day?

¶ How many non-chargeable hours?

¶ Do I get the benefit from a full day's work in the shop?

¶ How much do I lose by workmen coming in late and padded job costs.

¶ What profit each day do I make from each man employed?

¶ How much stock and supplies are wasted each day by careless shop methods?

Foreman Knows Conditions

The foreman can easily see what jobs are ahead by looking at the coupon on the schedulegraph. If a job has been promised at four o'clock on Wednesday as shown in close up view, Fig. 3, third job scheduled and the time estimated to do the job is four hours, which is indicated by the time strip, the foreman has information at a glance which permits him to assign a workman on the job so that delivery will be made on time. To get this job out at four o'clock it should be assigned to a workman at seven o'clock in the morning, if the estimate is correct the delivery can be made. When the job is assigned the work order card left on the job is removed and time entries are made, it is then placed in card holder on schedulegraph as shown in Fig. 3. This indicates that the job is being worked on, if no card is in this pocket behind the coupon holder the job has not been assigned.

Simple, effective and reliable is this method of controlling jobs. Scheduling of work is a sure agent to increase a keener appreciation of shop control. No guess work, promises that are really based on facts can be made by the shop.

TIME REPORT AND PAYROLL

Correct management means that greater financial benefit can be received with less efforts expended. In the past we have assumed that a business can just go along from day to weeks and months without any means of knowing absolutely just what the business is doing. However, at the end of the year a review of the business is made. But if losses are occurring it is too late to counteract them.

The yearly inventory and summary should be supplanted by more modern methods in which a constant check is kept not only on material but on methods of doing business. The standard to-day is effective control of employees, supervision of shop, costs of time and stores and such other essentials as make it possible to get all the profits which should be made from the volume of business done. A record as indicated in Fig. 4 will give daily the amount of chargeable labor and non-chargeable labor performed. The losses and gains are shown in your repair shop. To get information of this character placed on your desk each morning is certainly a lever that can be used to promote more effective shop control. A record of money-making facts are before you.

A Truck Inspection System

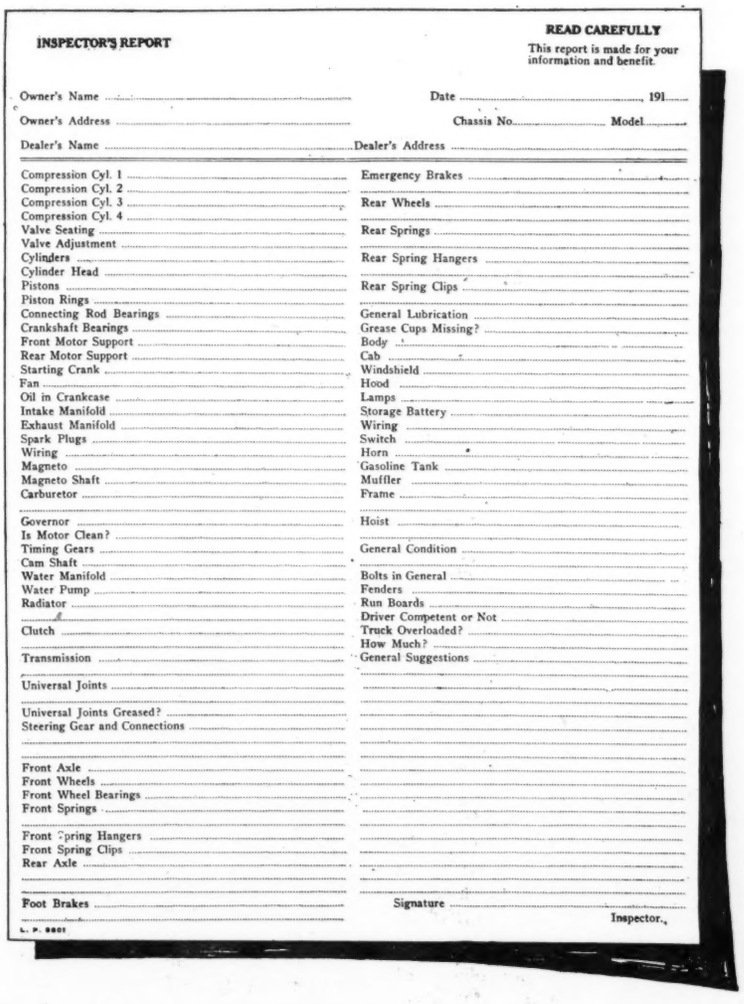
When Handled After the Plan of the Republic Sales and Service Co., of Kansas City, Mo., Will Cut So-Called Free Service Fifty Per Cent

THE Republic Sales and Service Co. of Kansas City, has cut its free service costs 50 per cent, has so distributed repair work that its reduced force is easily caring for it, and has got 75 per cent of the Republic trucks in Kansas City operating on a bed-rock bottom level of economy and efficiency. Owners are delighted with the trucks, and with the service.

These results have been obtained at a purely nominal cost, through the establishing of a free inspection system, with reports to owners on condition of trucks, suggestions on repairs that should be made immediately or soon, and hints as to misuse of trucks by drivers.

A. S. Austin, manager of the Republic Sales and Service Co., installed this service a few months ago, primarily to make sure that Republic trucks in Kansas City should all make good. The free inspection was offered to all owners, and many old trucks were brought in. The old vehicles often needed extensive repairs; and in most cases the owners ordered such repairs made. As the owners responded to the invitation, they were assigned dates on which the trucks were to be brought in monthly, for inspection.

The owners are listed on a card index, the cards being arranged chronologically according to these inspection dates. Notices are sent owners two days before inspection dates. If the truck does not appear, on the date set, a letter is sent the owner urging him to take advantage of the inspection and, if the case justifies it, allowing him the privilege of sending the truck on another date. The owner is warned that failure to use the inspection privilege is likely to react adversely on his truck, and possibly result in larger repair bills than otherwise would accrue.



INSPECTOR'S REPORT

READ CAREFULLY
This report is made for your information and benefit.

Owner's Name ..... Date ..... 191..
Owner's Address ..... Chassis No. ..... Model .....
Dealer's Name ..... Dealer's Address .....

Compression Cyl. 1	Emergency Brakes
Compression Cyl. 2	
Compression Cyl. 3	Rear Wheels
Compression Cyl. 4	
Valve Seating	Rear Springs
Valve Adjustment	
Cylinders	Rear Spring Hangers
Cylinder Head	
Pistons	Rear Spring Clips
Piston Rings	
Connecting Rod Bearings	General Lubrication
Crankshaft Bearings	Grease Cups Missing?
Front Motor Support	Body
Rear Motor Support	Cab
Starting Crank	Windshield
Fan	Hood
Oil in Crankcase	Lamps
Intake Manifold	Storage Battery
Exhaust Manifold	Wiring
Spark Plugs	Switch
Wiring	Horn
Magneto	Gasoline Tank
Magneto Shaft	Muffler
Carburetor	Frame
Governor	Hoist
Is Motor Clean?	
Timing Gears	General Condition
Cam Shaft	
Water Manifold	Bolts in General
Water Pump	Fenders
Radiator	Run Boards
	Driver Competent or Not
Clutch	Truck Overloaded?
	How Much?
Transmission	General Suggestions
Universal Joints	
Universal Joints Greased?	
Steering Gear and Connections	
Front Axle	
Front Wheels	
Front Wheel Bearings	
Front Springs	
Front Spring Hangers	
Front Spring Clips	
Rear Axle	
Foot Brakes	Signature
	Inspector.

L. P. 8801

When the truck is brought in, the service man runs its around the block or back and forth a few times in the building and writes down the condition of each item. A copy of the report is sent to the owner. They are quick to see the advantage of this system of inspection and the trucks are usually sent back in a few days with orders to make the repairs noted in the report

The inspection is done by the service man at the station, who makes out orders for repairs to trucks. It takes comparatively little of his time; in a few minutes he can run the truck around the block, or back and forth in the garage, glance at the various features on which reports are to be made, noting the comments himself or calling them off to a clerk, who writes them down on the blank. A notation is made opposite each item scheduled, in most cases naturally the report being "good" or "O. K."

One copy of the report is sent to the owner, who usually requires only one experience with such a report to recognize its value. In 75 per cent of the cases, where owners are real business men, the trucks are sent back to the shop within two days, with orders for the repairs to be made as mentioned by the inspector in the report.

One copy of the report is kept on file. It is valuable for reference, and in cases of controversy, with driver or owner, as to the reasons for particular conditions in the truck.

Educational for Driver

The card index—on which the fact of each monthly inspection is noted—used in connection with the copies of the reports, can usually supply the reason for a condition about which an owner may complain.

The inspector usually allows the driver to watch and ask questions as the inspection is being made—an educational opportunity for the drivers, of which the ambitious ones take full advantage. The inspector also asks questions, eliciting information on how the driver handles the truck—discussing just how much a 2-ton truck can carry—and so forth.

The Republic company gives free service on new trucks, for 90 days; and guarantees the trucks, making no charge for labor on repairs not required because of accident, etc., for a year. Now, this guarantee is contingent on the purchaser sending his truck in on the assigned date, monthly, for free inspection.

The Republic company gives perpetual free service on governors, cleaning, setting and resealing at any time free of charge. This service alone has probably done more to hold down the overspeeding of trucks than any other one factor.

This is a picture of the first of four sections of Nordyke & Marmon Co. service convention which took place last fall and was attended by distributors' service men from all over the country

Preaching Service from the Factory

How the Nordyke & Marmon Co. Educated Dealers' Service Men

GRANTED that a factory making a motor car knows more about that car than anyone else, then it stands to reason that the factory is best qualified to say how the car ought to be serviced. The factory is, therefore, in position to give to its distributors and dealers first hand information relative to the best and quickest ways of performing the thousand and one service operations incident to the life of any piece of automotive apparatus.

To that end the Nordyke & Marmon Co., Indianapolis, Ind., put on a series of service conventions that were attended by dealers' service men from all over the country. The convention lasted several weeks and each week a new set of students, as the service men were referred to, made the rounds of the factory and sat in session in a part of the factory set aside for the work, to hear and watch Bert Dingley and his men in the work of tearing down and rebuilding the Marmon 34. The entire convention was in charge of Mr. Dingley, whom the industry will remember as a stellar performer in the Pope-Hartford in motor events.

EDITOR'S NOTE: Along with the general plan of elevating service work on automotive equipment is that wherein the manufacturers of motor cars, trucks and tractors are inviting their service managers to the factories to get first hand information as to the best manner in which the factory product should be serviced. Rather than keep writing many letters to the factory it is infinitely better for the service man to visit the factory and there have staged for them by experts the proper ways for tearing down and reassembling a car or truck, as the case may be. It gives the men a chance to ask questions and thus get straight on any problem that might confront them. Also, by going through the factory the men see just how the product is built and can gage their service work accordingly. The pictures and story herewith show how Nordyke & Marmon put on a very successful service convention for their service men.

These are the men who did the actual work of demonstrating the service operations on the Marmon 34 to the visiting service managers. The work was under the supervision of Bert Dingley, who, in fact, conducted the whole service convention.

Ran Several Weeks

The first week of this school, comprising the first session of the convention started the latter part of last October and wound up in December.

Two hundred service men sent from the Marmon distributors attended the convention and went to the class work as enthusiastically as practical students are wont to attack a piece of real information. One of the best features in

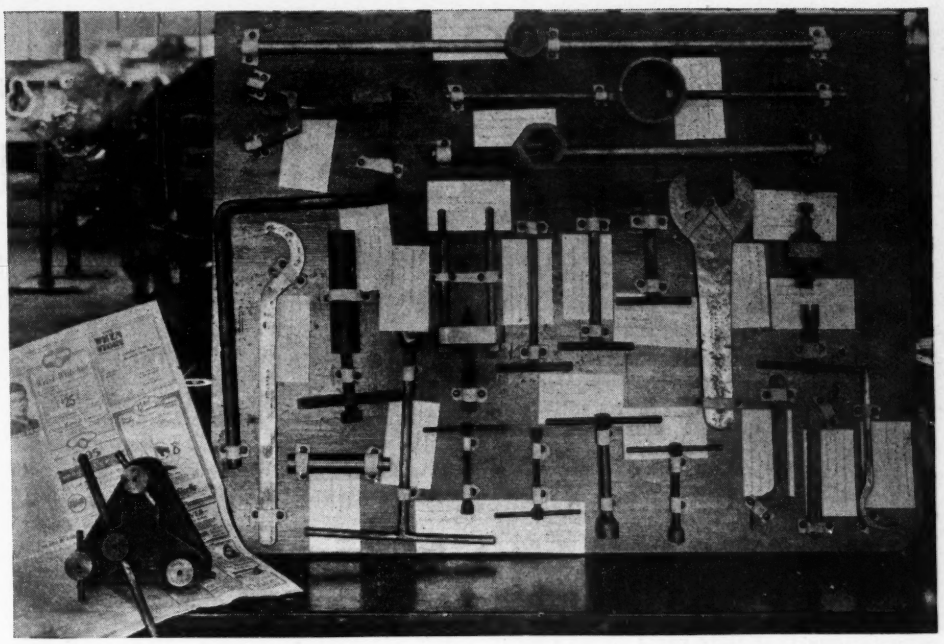
connection with the undertaking was the fact that the work was practical in the extreme.

The concern had set aside a portion of the factory and equipped it as a practical service shop. Here the factory experts tore down the cars while Bert Dingley explained the special construction and the best manner for tearing down and rebuilding. He brought out by questions just how adjustments and repairs that might be necessary should be handled.

Lectures by Factory Experts

During each week's convention lectures were given by carbureter and ignition experts sent from the factories whose products are used by the Nordyke & Marmon Co. and each of these lectures brought out many important points that have been voted by the service men as exceedingly practical and very high in value of new knowledge of the Marmon 34.

At the end of each week, on Friday night, the company gave a dinner to the convention at which there were interesting short speeches relating to the work. In connection with these talks, the fact was brought out that the service man today is about the most important part of the automotive industry in that he is the man who is responsible for the upkeep of motor car transportation. He is extending as valuable service to the country as does the railroad superintendent who is responsible for the steady procession of railroad traffic in his locality.

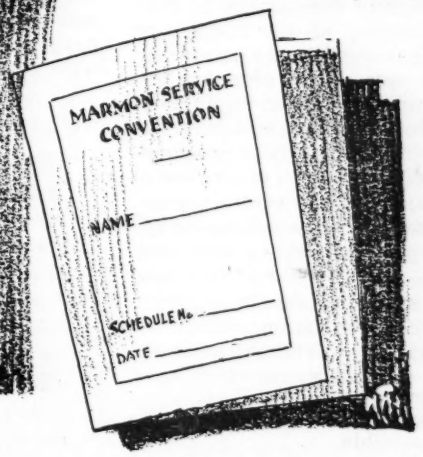


Tools brought out by Nordyke & Marmon to facilitate service operations. These include gear and wheel pullers, spanner wrenches, crowfoot wrenches and others. It is a great help to the service stations to have the factory design and suggest tools and fitments to speed up service on their product

SCHEDULES.

DAYS	HOURS	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
MONDAY	1-5 p. m.	Shop	Shop	Shop	Shop	Shop	Shop	Shop	Shop
TUESDAY	8:30 a. m. to 12 m. 1-5 p. m. 8:00p. m.	Car Shop Branch	Factory Factory Branch	Factory Factory Branch	Shop Car Branch	Shop Shop Branch	Shop Shop Branch	Shop Shop Branch	Shop Shop Branch
WEDNESDAY	8:30 a. m. to 12 m. 1-5 p. m.	Factory Factory	Car Shop	Shop Car	Factory Factory	Shop Shop	Shop Shop	Shop Shop	Shop Shop
THURSDAY	8:30 a. m. to 12 m. 1-5 p. m. 8:00 p. m.	Shop Shop Branch	Shop Shop Branch	Shop Shop Branch	Shop Shop Branch	Car Shop Branch	Factory Factory Branch	Factory Factory Branch	Shop Car Branch
FRIDAY	8:30 a. m. to 12 m. 1-5 p. m.	Shop Shop	Shop Shop	Shop Shop	Shop Shop	Factory Factory	Car Shop	Shop Car	Factory Factory
SATURDAY	8:30 a. m. to 12 m.	Shop	Shop	Shop	Shop	Shop	Shop	Shop	Shop

Facsimile of schedule card issued to each visiting service manager, which enabled him to immediately tell where and when he should be at any hour of the day



The schedule card was a folded affair, with the name of the individual on it

During the visit through the factory the service men came into contact with factory experts who expounded to them the theories and construction

Importance of Transportation

For instance, a 24-hour tieup of automobile traffic during a business day would congest a city like Chicago to a very large extent, and a week would almost bring the city to starvation. This shows the rapid development of the automobile and the prime importance of keeping it tuned to concert pitch.

Tractor Service in Southwest Needs Stimulation

Big Problem at Present Is to Arouse Dealers to Sense of Responsibility —Must Realize He Is the Man Who Must Service the Tractor He Sells

By FRED M. LOOMIS

THERE is a most lamentable lack of service sense with the majority of the dealers who are trying to sell tractors in the Southwest today.

There are dealer organizations in the trade, some of which have been laboriously built up, which are falling far short of expectations. In the matter of service in particular, they are not measuring up to expectations.

Indeed, so far are they falling below expectations that they seem to be almost hopelessly deficient. Thus a really important problem today is to arouse in these dealers a sense of their responsibility in this respect. Otherwise, they surely will have to be displaced, and some other and better dealer will succeed them.

The foregoing is not a prelude to a discussion regarding the respective merits or qualifications of the motor car dealer as compared with the implement dealer. There are sales organizations which are composed almost exclusively of implement dealers; there are others in which the motor car element predominates almost to the exclusion of dealers of any other kind; there are still other organizations wherein the two elements are mixed, the proportion varying with each individual case. And in view of this fact, it is safe to say that not in a single instance is the organization, either regarded as a case of individual dealers or as a collection of dealers, anywhere near 100 per cent efficient.

Perfection Impossible

Of course, it would be a pertinent criticism right here to say that 100 per cent efficiency is an impossibility. Surely it is, and no one knows this any better than he who is writing. There is no such thing as perfection in tractor dealership —always there will be a deficiency somewhere. But, there are certain fundamentals to which every dealer should conform and to perfection in which he should aspire, so that in the end he may approximate perfectability. The trouble is that a great many dealers do not appear to be making even an effort and thus the standard of tractor dealer organizations is lower than it ought to be.

Were this a condition which did not admit of improvement then a profoundly pessimistic view of the future of the tractor trade would be entirely justifiable. But such is not the case. Improvement, and vast improvement, is possible. Indeed, the factor which makes for improvement already is easily discernible, and it only remains to encourage and foster this factor to make of tractor selling organizations the most efficient and perfect organizations the farm operative equipment business ever saw.

In writing of the organizations as they exist today, one feels constrained to find fault and to criticize and to point out in what ways they are failing to measure up. Again, it is fair to repeat the assertion that none of them, irrespective of their constituent elements, is measuring up. The best that can be said is that some are better than others, with all falling far short of perfection.

Lest it be thought the writer is prejudiced in this matter, and that he is taking snap judgment, what follows will be for the most part enclosed in quotation marks. The writer within the last few days has had the privilege of talking with state distributors of tractors, with branch house managers, and with others who are in direct contact with sales and service conditions in the Southwestern field. The men who will be quoted are thoroughly qualified to talk, because their information is first-hand. As stated before, they are in intimate and daily contact with conditions as they are, and their's is the problem of improving them, if they can.

> ¶ *"Most of our dealers fail primarily in service. A majority of them still persist in calling us on the phone every time something goes wrong and insisting that we send a man to fix it. Sometimes it happens that the dealer himself has never gone near the tractor and has not made the slightest effort to remedy the trouble before calling on us. Manifestly this is all wrong."*

Tractors in the Southwest

Fortunately, for the purpose of this article, the series of interviews which will be drawn upon has unity. It has unity of time and place. Every one has transpired within the last two weeks, and all consider conditions as they are at the present time in the Southwest. Admittedly, conditions may be and are different in some other sections of the country, but inasmuch as the possibilities of the tractor trade are enormous in the Southwest, and inasmuch as it is important for the industry to know what these conditions are, so that the proper correctives may be applied, the writer deems the interviews he has had are well worth while careful consideration.

In every case identity has been concealed. These were heart-to-heart talks, and it would be neither fair nor politic to betray confidences. At the same time the writer has permission to use them as he does use them. All he desires to say in this connection is that the interviews were with men prominent and responsible in the tractor trade of the Southwest and that they are reported as nearly verbatim as it is possible to do within the limits of a magazine article. Necessarily, they are condensed, but this merely robs them of some of their human interest, without impeaching their verity.

Almost without exception the men interviewed were unanimous in condemning the indifferent attitude of their dealers toward their service liabilities. In addition, some of them call attention to the fact that the dealers, or at any rate a good many of them, are laying down quite as much on the job of selling. In other words, there are a great many dealers in the Southwest who seem to feel that they are not called upon to do any more, either in the direction of selling or service, than they were accustomed to do ten years ago,—before modern conditions in the tractor industry arose. They seem to feel that their connection with the tractor trade is still the inconsequential part they used to play, and that the tractor manufacturers are rather presuming when they insist that they shall do more for the compensation they now receive. Generally speaking, this compensation is higher than it used to be.

Discount Now Higher

Old-timers in the trade will remember that prior to the year 1914 the average discount on tractors allowed the dealer for commission averaged about 10 per cent. At the present time the average rate of discount has been advanced at least one-half and may be considered to be in the neighborhood of 15 per cent and in some cases running as high as 20 per cent. Naturally, one would suppose that with this increased rate of compensation the dealer would appreciate the fact that he should do more to deserve it,—but judging from the attitude assumed by the dealers, they do not do so, but appear to be trying to get across with the old inactivity. This is clearly brought out in the following, which is taken from an inter-

view with a sales manager of one of the largest implement houses in Kansas City, who surely is having his troubles with his tractor dealers. He says:

"Considering our line of goods and the position we always have occupied in the trade, it is absolutely necessary for us to stick by the retail implement dealer. Our volume of business still is on horse-drawn implement, and we cannot adopt a policy of dividing our line. Our tractor and power equipment line must go with our horse-drawn line and this puts us irrevocably into the implement column.

"This being the case we profess to believe—maybe we are just kidding ourselves, I don't know—but we profess to believe that ultimately the retail implement dealer will become the best and most acceptable tractor dealer. That is what we hope at any rate, and that is what we plan to accomplish. But we realize we have a long, hard row to hoe in educating the average dealer so that he shall come up to specifications.

"For the fact is, and we must admit it, that up to this time, the implement dealer, speaking of him generally, has not come up to the mark. As a dealer he is deficient, and how we are going to make him efficient is a problem to which we are giving a great deal of thought.

"Most of our dealers fail primarily in service. A majority of them still persist in calling us on the 'phone every time some little thing goes wrong, and insisting that we send a man to fix it. Sometimes it happens that the dealer himself has never gone near the tractor and has not made the slightest effort to remedy the trouble before calling on us. Manifestly, this is all wrong.

Farmer Expects Service

"The farmer has a right to expect that the tractor dealer must not only equip himself to give service, but that he shall give it promptly and efficiently. It must be admitted that the implement dealer, as a rule, is not doing this. Maybe he can't, I don't know. The majority of our dealers do not sell tractors enough to warrant them hiring a high priced mechanic and equipping a service department. You hardly can blame a small dealer for not doing this, at least for two or three years, or until he has a sufficient number of machines in his territory to warrant it. And yet, the tractor trade has reached the point where it is impossible for the branch house itself to give the service. As it is now, over half the overhead cost of conducting our tractor department is the cost of service we are compelled to give free for the benefit of the dealer."

And here is a part of an interview with the manager of another of the big implement and tractor houses in Kansas City, a man who has been in his present position for more than a quarter of a century and than whom there is no man better acquainted with the character qualifications and limitations of the dealers in the territory he serves. He says

"On the whole, the retail implement dealer does not measure up to requirements. You see the average implement dealer has been handling a line of goods for years on which he had to give little or no service, and upon which what service he did give was given free. Apparently, he does not understand that service is an all-essential factor in the tractor trade. He thinks he ought to get across without giving a larger measure of service on tractors than he has been accustomed to give on his old line of horse-drawn equipment. Where the implement dealer falls down particularly in this respect is in not stopping to think in the majority of instances it is the ignorance of the tractor owner which gets the latter into trouble. He does not understand that the way to remedy this is to post himself so thoroughly that he can in turn instruct his customers what to do. He simply sells the tractor and trusts to luck. If anything goes wrong he neither knows what to do nor has he the equipment wherewith to do it and in consequence he sends to us for help. Of course, we maintain a service department. That we have to do,—it's part of our job. And we shall have to keep it in commission until the dealers learn to take care of their own troubles."

> ¶ *"Where the implement dealer falls down is in not stopping to think that in a majority of instances it is the ignorance of a tractor owner which gets the latter into trouble. He does not understand that the way to remedy this is to post himself so thoroughly that he can in turn instruct his customers what to do. He sells the tractor and trusts to luck. If something goes wrong he neither knows what to do nor has the equipment for it and in consequence sends to us for help."*

Must Sell Power Equipment

While in the preceding quotations the complaints have been registered more directly against the retail implement dealer, it is only fair to say that later on in the interviews, both gentlemen quoted took a similar fall out of a good many of the motor car dealers. They admit that the motor car dealers are better equipped for service, and as a rule do not call upon the branch house for quite as much assistance, but they claim they fall down in other respects, notably in handling the power equipment which must go onto the farms with the tractor. Also, they claim that some of them do not seem to realize the necessity of departmentizing their business, and selling tractors as a distinct commodity separate and apart from motor cars.

In this connection, the Kansas City manager of a tractor and thresher concern which has a very large percentage of motor car dealers in its sales organization has the following to say:

"While our dealer organization is preponderantly implement, of course, we have a very large percentage of motor car and exclusive power equipment dealers. In fact, the dealers who have made the biggest success in the business, and who have cost us the least money in the way of service attention, belong to the two latter classes. The implement dealer, as a distinct class, is waking up and is improving. The influence of conventions, shows and the example of other sorts of dealers, are bringing him to a realization of the fact that if he is going to share in the profits of the tractor business, he must get busy, put in a service organization, and sell tractors as they ought to be sold. Up to the present time, however, the implement dealer, as a rule, has not done this, but, as I say, he is waking up. The only question is, won't a good many of them wake up too late, I should say that at the present time the implement dealer is not better than 50 per cent efficient as a tractor dealer."

Some Lack Salesmanship

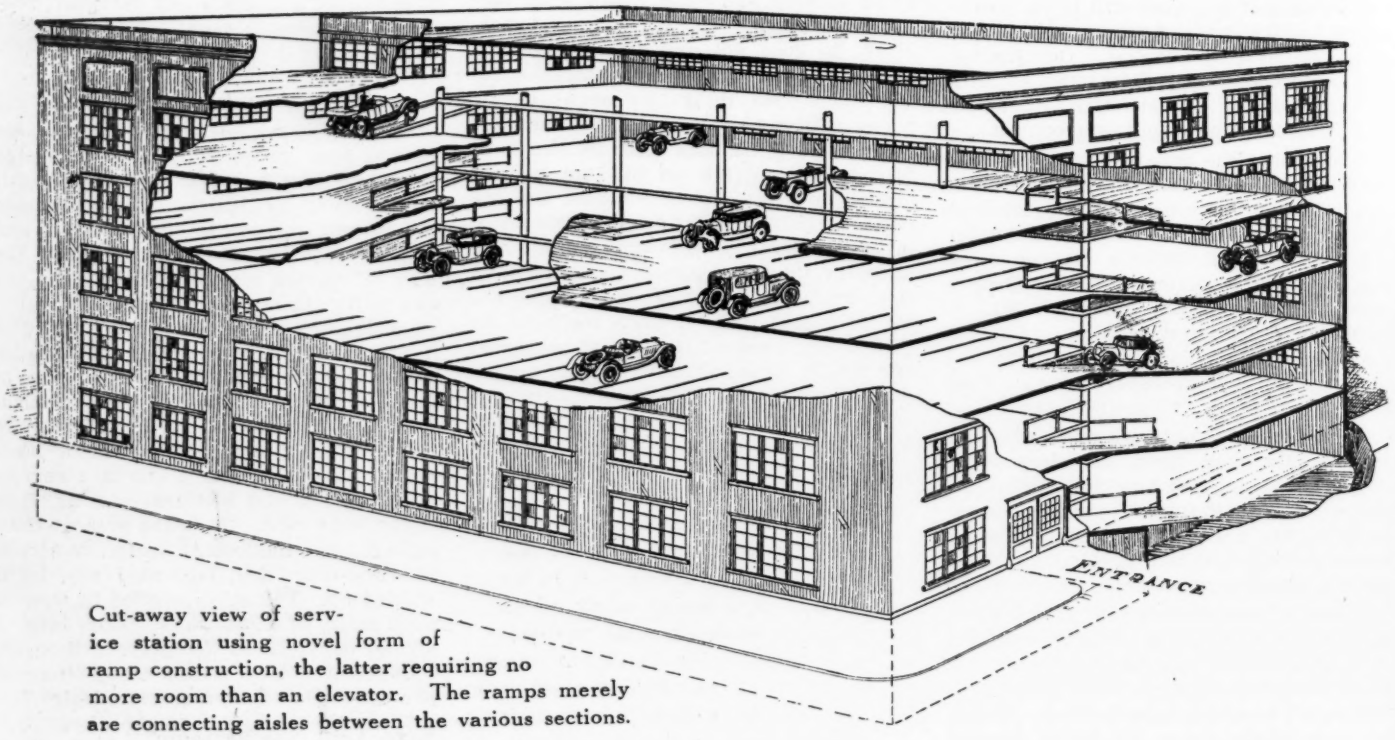
But, perhaps this is enough. Such interviews could be multiplied indefinitely. The writer had almost identical talks with tractor distributors and branch house managers in Kansas City, Wichita, Oklahoma City and Dallas. In fact, the entire Southwest seems to be afflicted with the same complaint. And, in this connection, a while back it was said that the dealer was laying down on the job, not only as a purveyor of service, but also as an efficient salesman. In proof of this last assertion, listen to what the manager of one of the old line houses at Oklahoma City says about his dealers:

"We have been putting our tractors into this territory for about three years, and the results to date have not been very satisfactory as far as the dealer is concerned. For instance, in the year 1918 we sold 105 of our tractors in this state. Our own salesmen had to go out and sell ninety-five of these to the farmers, and in a majority of instances, had not the slightest assistance from the dealer, except possibly in the matter of loaning the salesman a motor car. The next year we increased our trade to 119 machines, and again our own salesmen had to go out and close the deals for more than 100 of them. And when it comes to the matter of service, the dealer is hopelessly out of the running. Were it not for our

(Cont'd on page 43)

Ramp Construction Which Saves Space

Staggered Floor Arrangement Which Has Space Economy of Elevator



Cut-away view of service station using novel form of ramp construction, the latter requiring no more room than an elevator. The ramps merely are connecting aisles between the various sections.

By HAROLD F. BLANCHARD

THE convenience of the ramp can be combined with the space economy of the elevator by the use of a new principle which is best described as a "staggered floor" construction. It is adapted to buildings 75 by 100 ft. and larger and may be used for any number of stories. In the building shown, which is 100 by 150 ft. five stories and basement, fifty-one more cars may be accommodated than if the same building had the usual ramp construction.

The popular objection to ramps has been the amount of valuable building space which they occupy. Another drawback, just as serious but not so generally appreciated, is that in nine out of ten buildings the very bulk of the ramp causes a twin difficulty, which involves the loss of much additional storage space. Its size naturally limits the choice of its location in the building, a situation which usually calls for the use of much additional space for ramp approaches, on the one hand, and on the other, the lack of flexibility in ramp location, and therefore in connecting aisles or approaches prevents the utilization of the most efficient car arrangement. As stated previously, these shortcomings are not generally appreciated because relatively little attention has been tle attention has heretofore been paid to the efficient arrangement of buildings, with the result that the average owner of a ramp building has little idea of how much his ramps are really costing him.

The new design is perhaps best described as a staggered floor construction. The building is divided equally into two vertical sections and the floors in one of the sections come halfway between the floors in the other section. Each floor in each section carries two rows of cars facing a common aisle.

Ramps Are Connecting Aisles

A car proceeding from the street to the top floor therefore is driven to the rear of the ground floor, up the ramp at the rear to the first floor of the other section. Then it comes forward and ascends the ramp at the front of the building, going to the second floor in the first section. And so on up.

The space economy resulting from this construction should be obvious. The ramps are really nothing more than connecting driveways between the main aisles and would be required in any case.

The grade is between 20 and 25 per cent, depending largely on the distance between floors. The ramp length is about 30 ft.

Although the ramps are located at the extreme front and rear in the illustration, this position would be used only in a short building—say 75 ft. In all longer buildings the front series of ramps would be placed about 70 ft. distant from the rear, thus cutting to a minimum the distance which must be traveled in ascending or descending.

The extreme economy of the staggered floor ramp construction is readily appreciated when actual buildings are considered. In a building 100 by 100 ft. with four rows of cars facing on two 20-ft. aisles there is accommodation for sixty cars if no space is allowed for inter-floor transportation of any sort. Sixty cars may therefore be considered as 100 per cent utilization of the space and may be used as a standard of comparison.

The same building with staggered floors will carry fifty-four cars, and with two elevators fifty-six cars.

To allow a fair comparison of the new and old ramp types let us consider a building 100 by 100 ft., which is the size of the building illustrated. From the figures below it is seen that the efficiency of the elevator and staggered floor ramp types for the building in question is the same—90 per cent. The construction is therefore as economical of space as elevators and 7 per cent more economical than ramps of the usual type. Furthermore, 51 more cars may be stored than if the building had ramps of the usual type.

Type	Total Cars	Cars per floor	Sq. ft. per car	Efficiency
Usual ramp type	441	73.5	204	83
Staggered floor ramp type	492	82	183	90
Elevator type (three)	486	81	187	90
No interfloor transportation	528	88	170	100

Keeping Repair Parts Stock

How the Fulton Truck Co. of Philadelphia Keeps Stock Record — Their System in the Shop in Connection with Periodic Inspection Plan

In Two Parts

EDITOR'S NOTE: The Fulton Truck Co. of Philadelphia has, by a plan of periodic inspection, been able to regulate the amount of work in their shop at all times. This week's story deals with the system in their repair shop along with the method of keeping stock. The Service Parts Wall Chart is of especial interest.

Part Two

Taking the monthly inventory of parts stock. Note the arrangement of the bins and stock cards over each bin, containing a history of that particular stock

Unpacking new stock from the factory to put in the bins. A small red tag is slipped over the tack over each bin to signal the stock clerks that the bin is empty

THE Inspection Report is a triplicate form. The top sheet is a blank, white one, whereon the stenographer types what is to be done in the way of repairs under the various groupings. The typed white sheet is the copy sent to the owner, as mentioned in the Owner's Notification. A blue copy of the form goes to the office at the same time the white top sheet is sent to be typed and the inspector files the duplicate for reference, under the owner's name, in the repair department of the service station.

When a truck is again inspected, the previous Inspection Report is examined for comparison by the inspector, who can see if there is a tendency for any one part of the mechanism to need adjusting. He usually is able to tell whether it is the fault of the owner, who, in that case, will be informed, or of the mechanism or adjustment itself.

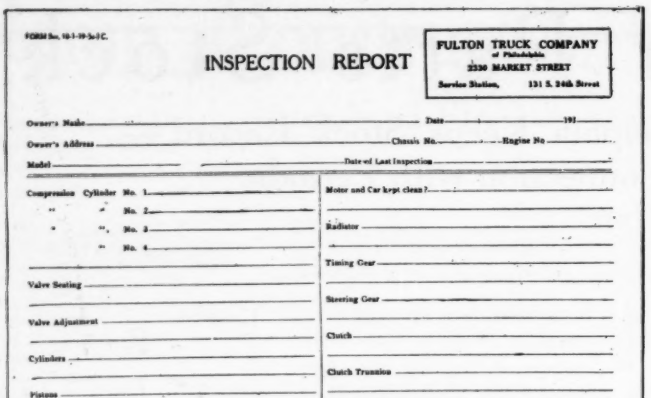
All owner-equipment is checked on entry of a truck, and placed in bins in the stockroom, where it is under the care of a stock boy, who is responsible for it.

A triplicate form is used for Shop Order, Parts Department Sheet and Office Voucher. The Shop Order is a manilla card, the same size as the other two sheets that go with it—namely, 8½ by 10 in. It has, of course, its shop order number, and

SERVICE PARTS STOCK

SYMBOL OR PART NO.	SECTION	DIVISION	BIN NO.	SYMBOL OR PART NO	SECTION	DIVISION	BIN NO.
				MOTOR GROUP			
274-B	1	B	1				
				CONNECTING ROD &	PISTON	GROUP	
2756	1	A	7-8				
				VALVES	GROUP		
2851	1	B	8				

SERVICE PARTS WALL CHART used in the stockroom of the Fulton Truck Co. of Philadelphia service station. This chart, in plain view of stock clerks at all times, saves time by showing at a glance under Groups, Parts Numbers, Divisions, Sections and Bin Numbers the exact location of any part in the stock. Even a new employee could locate any part desired in a moment



INSPECTION REPORT

FULTON TRUCK COMPANY of Philadelphia
2330 MARKET STREET
Service Station, 131 S. 24th Street

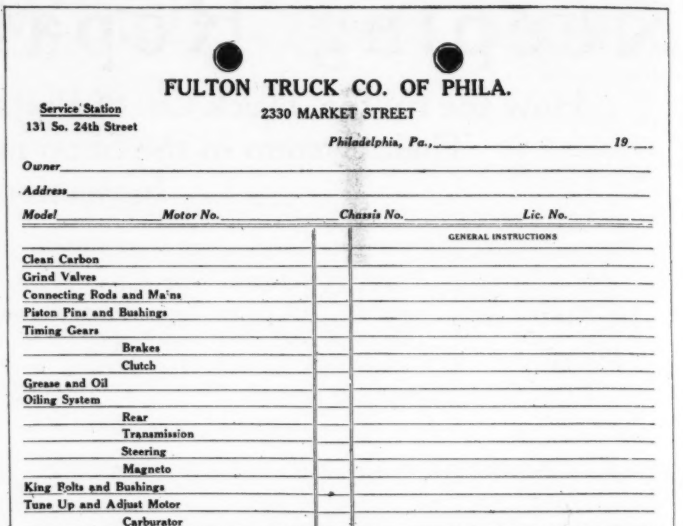
Owner's Name ... Date ... 191
Owner's Address ... Chassis No. ... Engine No.
Model ... Date of Last Inspection

Compression Cylinder No. 1
" " No. 2
" " No. 3
" " No. 4
Valve Seating
Valve Adjustment
Cylinders
Pistons
" Rings
Connection Rod Bearings upper
" " lower
Crank shaft Bearings
Oiling System
Magneto
Spark Plug
Carburetor
General Lubrication

Motor and Car kept clean?
Radiator
Timing Gear
Steering Gear
Clutch
Clutch Trunnion
Transmission
Gear Shifting
Foot Brakes
Emergency Brakes
Differential and Gears
Hub and Caps
General Condition
Motor Clutch
Wiring

General Condition
Driver { Competent / or / Not
Overloading Truck? How Much?
Average daily mileage No. working hours
Suggestions
Signature Inspector

INSPECTION REPORT—This form is made out in triplicate. The top sheet is a white blank whereon the stenographer types the repair items to be done. This is the owner's copy. A blue copy goes to the office and the inspector files the white duplicate for reference in the department



FULTON TRUCK CO. OF PHILA.

Service Station
131 So. 24th Street

2330 MARKET STREET

Philadelphia, Pa., ... 19...

Owner
Address
Model Motor No. Chassis No. Lic. No.

GENERAL INSTRUCTIONS

Clean Carbon
Grind Valves
Connecting Rods and Mains
Piston Pins and Bushings
Timing Gears
Brakes
Clutch
Grease and Oil
Oiling System
Rear
Transmission
Steering
Magneto
King Bolts and Bushings
Tune Up and Adjust Motor
Carburator

Have examined my car and found same to be satisfactory. I accept charge for repairs hereon and agree to pay the sum of ... dollars for labor performed and material furnished

Received the above car
... 19...

SHOP ORDER № 519

SHOP ORDER CARD. This manilla form is one of a triplicate, 8½x10 in. On it are checked off the repairs to be made and general instructions are written in. The manilla card is placed in a leather envelope with transparent face and attached to the truck to be repaired, being removed when the job is completed. The customer signs for it

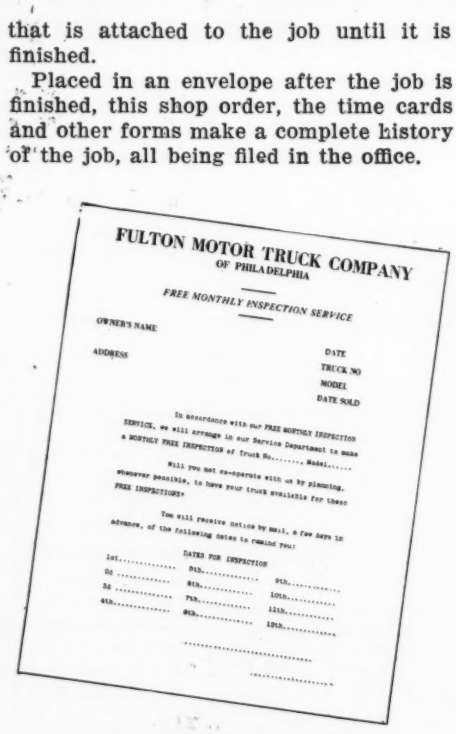
on its back the mechanic enters his time on each job done on the truck, totaling his hours. Storeroom charges and whatever outside repairs may have been needed, are entered. In this case the serial number appearing at the top of the card, on its back, will be the same as the shop order number on the face, only with a zero mark, preceding. This card goes in a leather case with isinglass front and is attached to the truck.

The white sheet retained by the Parts Department is a replica of the others on its face and the same as the Office Voucher on the back. The designations, "Shop Order" and "Parts Department" are indicative of their disposal when filled out. The back of these two forms have spaces for Job Number, Owner's Name, When Completed, Rate, Quantity, Number, Description and Remarks, as well as Signature.

Checking Mechanics' Time

The usual type of Shop Order Time Card and Weekly Job Card are used. The workman punches his clock card when he starts and whenever he stops and every night on the back of his Job or Shop Order he fills in the time and totals up the hours himself. These totals must balance, that is, the total of the Shop Order time must correspond with the time on the time card. There are then three checks against the mechanic—his daily time card, his weekly job card and the record on the back of the shop order that is attached to the job until it is finished.

Placed in an envelope after the job is finished, this shop order, the time cards and other forms make a complete history of the job, all being filed in the office.



FULTON MOTOR TRUCK COMPANY
OF PHILADELPHIA

FREE MONTHLY INSPECTION SERVICE

OWNER'S NAME
ADDRESS
DATE
TRUCK NO
MODEL
DATE SOLD

In accordance with our FREE MONTHLY INSPECTION SERVICE, we will arrange in our Service Department to make a MONTHLY FREE INSPECTION of Truck No. ..... Model .....

Will you not co-operate with us by planning, whenever possible, to have your truck available for these FREE INSPECTIONS?

You will receive notice by mail, a few days in advance, of the following dates to remind you:

DATES FOR INSPECTION

1st ..... 5th ..... 9th .....
Or ..... 6th ..... 10th .....
3d ..... 7th ..... 11th .....
4th ..... 8th ..... 12th .....

FREE MONTHLY INSPECTION SERVICE NOTICE

Sent to customer to insure his keeping regular "dates" for inspection of his truck at the Fulton Service Station. Customers are given "turns" and are induced to keep the appointments

The checking system for obtaining parts and tools from the stockroom bins and the method of keeping them replenished are different from any others the writer has seen. Stock cards, 5 by 3 in., white, are used. These have spaces and columns, the entries being: Name of Part, Part Number, Model Number, Minimum, Requisition Number, Date, Quantity Received, Requisition Number (repeated), Amount and Quantity on Hand. All stock drawn on requisition is recorded on the cards.

Monthly Inventory of Stock

There is a monthly inventory and close track is kept in the "Quantity on Hand" column of the stock card of the amount of parts in stock of each part. As the parts are drawn, of course, entry is made on the stock cards. The stock card for each bin is tacked in the center over it. This keeps the record of that bin in plain sight, showing at a glance what is in it and what has been withdrawn, as well as what it needs to keep it up to normal. As soon as all the parts have been withdrawn, a zero is placed at the bottom of the column and this is repeated at the top when the next card is put in place.

When the bin is getting low and needs replenishing, a bright red tag, 2½ by 1½, in. is slipped over the tackhead and is an unmistakable signal that the bin is empty. The stock boy makes it a part of his daily work to keep his eye on these bin tags, noting the red ones and

acting accoordingly. When the stock of parts for the red-tagged bins has been replenished, he removes the tags.

While the bins vary in size, most of them are capacious enough to hold the average amount of stock used in a month, of each kind, with some to spare.

Checking up for drawing tools from the tool stock supply is based on a brass check system. A board hangs in the outer stockroom near the entrance to the inner stockroom, fashioned on the general plan of the hotel key board seen in most lobbies behind the clerk's counter. This board in the Fulton service station is divided into space, at the top of which is a small metal plate bearing the name of the tool in that division and a number corresponding with the number on the brass check which is to be hung on the little hook in the center of the space when a mechanic has taken a tool so designated. Each mechanic has a supply—at the present time it is ten—of these brass checks and as he requires a tool, he takes it and hangs the brass check to correspond on the little hook in the proper space on the board.

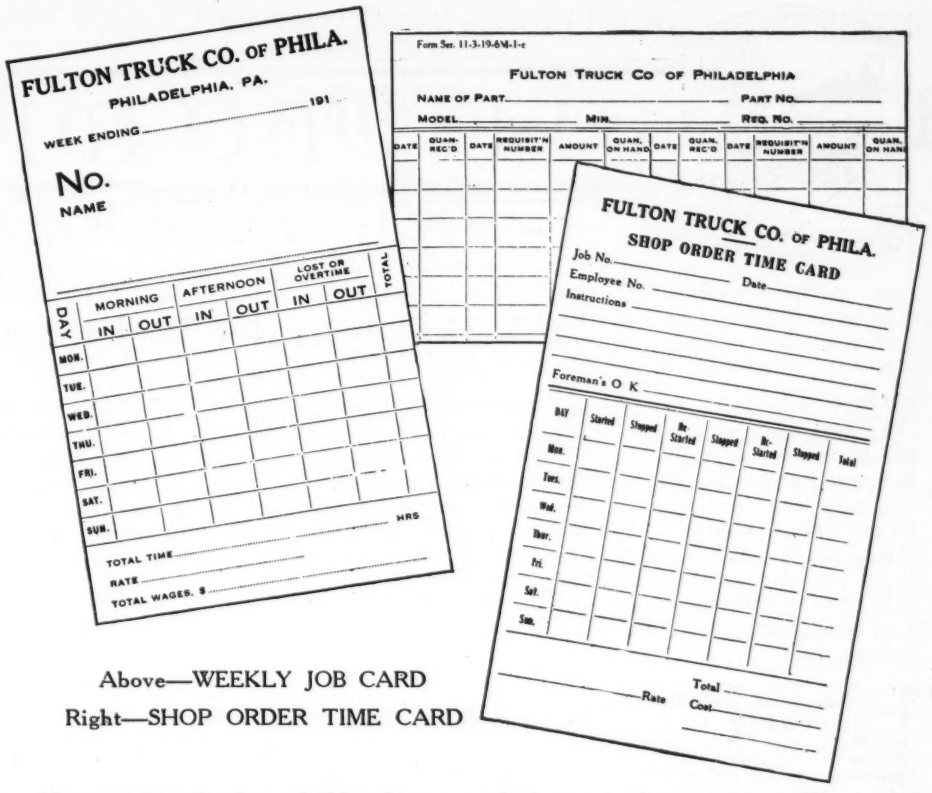
Checking the Tools

The tool and allied equipment as indicated on the metal plates in the spaces, for instance, are as follows:

Drills—U. S. S. Dies, U. S. S. Taps, S. A. E. Taps, S. A. E. Dies, Jacks, Electric Drills, Gear Pullers, Blow Torch, Sledge Hammer, Soldering Acid, Socket Handles, Droplights, Files, Shellac, Soldering Iron, Wrenches, Tap Handles, Hub Wrenches, Valve Compound, Stock Handles and Valve Lifters.

The bins are in sections and divisions, as well as being numbered separately, the sections running across, or horizontally.

Working on radiators at the special radiator bench



Above—WEEKLY JOB CARD
Right—SHOP ORDER TIME CARD

Upper right—Stock cards like this are tacked over each parts bin in the stock department and contain a history of that particular stock

This is the sort of small red tag that is slipped over the tack on the stock cards to signal to the stock clerk that the bin is empty. When a bin has been replenished, the tag is removed

The ten tags distributed to each mechanic symbolize the ten tools and working equipment most needed in the ordinary day's work; but each mechanic can have as many as he needs on application, record being taken of the number of the checks.

Service Parts Wall Chart

Something not seen in any other service station in Philadelphia, thus far, is a Service Parts Wall Chart, 1½ by 3 ft., hung in the outer stockroom over the shelf-like arrangement whereon the stock clerk does most of his work of making entries and checking up.

This chart which is used constantly for reference as to location of parts by part number, section, division and bin number, is a convenient arrangement which saves looking up such references in a book. It is always in front of the stock clerk and should an assistant unfamiliar with the stock arrangement, a substitute, or a new employee be placed in charge of stock for the time being, the chart would be especially helpful.

The chart shows the exact location of any part at once. Each sort of stock has a symbol, in letters and a part number, and each division is designated by a letter. The groups are as follows:

Engine
Connecting Rod and Piston
Valve
Oil Pump
Starting Crank
Manifold
Camshaft
Crankshaft
Ignition Drive
Magneto Connection and Cont.
Carbureter
Carb. Cont. and Conn.
Clutch
Transmission and Main Shaft
Transmission Countershaft
Transmission Main Drive Gear
Transmission Gear
Front Propeller Shaft
Rear Propeller Shaft
Dead Axle Brake Housing
Jackshaft
Bevel Drive Pinion
Internal Brake
External Brake
Internal Gear
Brake & Clutch Pedal
Brake Rod
Steering Gear Assembly
Drag Link
Front Axle
Frame & Bracket
Radiator Assembly
Hood
Dash Tank & Running Board
Muffler
Front Spring
Rear Spring

Shop equipment on the second floor includes an 18-in. arbor-press, 1½ tons, a light speed lathe, an engine stand, a power drill-press for general motor car work; a derrick hoist for such uses as lifting front end of car for boring axles; a chain-hoist and a portable acetylene welder for straightening frames.

The company's service truck is a 1½-ton Fulton and its equipment consists of three-wheel jack, tow chain and a special kit containing rear housing studs and special spring clips, sockets and bolts for emergency work.

EDITORIAL

A National Service Men's Association

WITH associations of the men connected with automotive service being formed in various parts of the country, the industry bids fair to have, perhaps in a year or so, a National Automotive Service association. It daily is becoming more and more realized that service or maintenance of automotive apparatus is the most important phase in the extension of automotive vehicles. It, therefore, is logical to assume that local associations formed for the betterment of service conditions all can join hands in the work eventually, thus producing a powerful factor to guide the destiny of service work.

THERE is no selfish motive back of the men undertaking the formation of service associations. There is nothing about the work that sounds like a labor union. There is no jealousy among the dealers or men connected with the companies. The service associations have as their greatest object in view the uplift of the craft, both in the eyes of the dealers and men engaged in the work and in the eyes of the customers.

THERE are a great many common problems affecting service conditions. It is, of course, a great thing when the men from a single organization get together and discuss ways and means to better their own conditions, but vastly bigger things are possible when men connected with the same sort of organizations get together in their community for a common good. Collectively these men can discuss problems peculiar to their business, otherwise impossible where there is disorganization.

WHEN we ultimately come to the point where we have a hundred or more service men's organizations throughout the country, it is not folly to consider the advisability of such organizations forming a single organization. Just like we have our dealer organizations welded into the National Automobile Dealers' association, so might we in turn expect the future to produce a service men's organization—the National Automotive Service association.

Aluminum and the Dealer

IN these days when the dealer's service problems are limited in the extent of their ultimate solution by the acute shortage of mechanics, the intensive study being devoted to the greater use of aluminum with the idea of simplifying the service problems, should come as a bit of comforting news. With the parts of a car made so light that one man can remove any or all of the car units, it is easy to see where greater accomplishment will result from the efforts of the man. Front axles, weighing but 35 lb. instead of 80 or more pounds, is one example of what the greater application of this light weight metal means.

The dealer whose eye views the results of changes in motor car construction is apt to form opinions that have not the proper perspective, if the entire field is not brought under view at the same time. To illustrate this point: When aluminum pistons were first introduced, the dealer experienced a lot of trouble that he had not anticipated. But, as time advanced these difficulties were met and have been gradually overcome. Opinions formed during the early inception of the light weight piston persist, and we find that many service men, who have never had actual experience with light weight pistons, but who have heard some brother repairman talk, are inclined to make light of the application of this metal.

Getting the Most Out of Shows

THE motor car shows of this year had several innovations that made them distinctly different from the shows we have been accustomed to for the last few years. Probably the innovation that had the most widespread effect was the one put on at the important shows by Nordyke & Marmon wherein factory experts tore down and rebuilt a Marmon engine, primarily, of course, to show the accuracy of construction and accessibility, but incidently to show the factory approved service operations connected with the maintenance of Marmon cars.

BUT aside from the educational effect this exhibit had and the many lessons it taught service men all over the country, dealers cashed in heavily on sales from it. It is quite likely that next years' shows will see a larger number of similar displays, judging from the great throngs that crowded this exhibit. So, we offer this as a tip to the manufacturer or dealer: If you are going to be at the shows next year, instead of the same layout of cars, palms, catalogs and the rest of the material that goes to make up the conventional exhibit, plan some sort of exhibit that has some life to it, not a revolving chassis, or things like that, but let two or three men perform some sort of service operations on your car or engine.

IF your engine or car is accessible such an exhibit will tell the multitude of buyers and at the same time drive home to the visiting service men and dealers the approved methods of service on that particular job. As the shows are held to make sales, let us see what effect the Marmon engine teardown and rebuild exhibit had, in New York. Thirty-eight cars were sold at the show, in Chicago seventy-six and now comes word from San Francisco that eighty-nine cars were sold there during show week, representing something like $523,000. At the San Francisco show there were about twelve hundred prospects drawn to the car exhibit of the Marmon dealer by virtue of the engine teardown exhibit held in another part of the building.

Service Men of Twin Cities Get Together and Form

NORTHWEST AUTOMOTIVE SERVICE ASSOCIATION

MINNEAPOLIS, Minn., March 5—Fifteen men connected with automotive service work in Minneapolis and St. Paul sat in session here to-night and put on its feet the Northwest Automotive Service Association.

This move has been contemplated for some time, but was withheld until B. S. Fuller, service manager of the Minneapolis Nash Co., took the bull by the horns and by personal calls and telephone invited the men to meet to-night in the salesroom of his company to talk over things, with the central thought of forming a service men's organization for the purpose of bettering service conditions.

EDITOR'S NOTE—If dealers and service men in cities at present not blessed with a service men's organization like that formed in the Twin Cities the other night, could have sat in session there and watched the enthusiastic way in which they launched the organization, it's a safe gamble that they would not lose another day before taking steps to get together, talk things over and start a similar organization. We are going to have a National service men's organization some day, sure as fate. Those who get in on the ground floor now are the ones to get the first benefits.

How successful this get-together meeting was is evidenced by the fact that before the evening was half over, temporary officers had been elected and the association looked like a dead sure thing. Enthusiasm was unbounded. Every man present thoroughly favored the idea of organizing for the betterment of service conditions. The meeting was scheduled on short notice and this fact, coupled with the sub-zero weather prevented the attendance of many other service managers who previously had signified their intention of being present whenever a meeting was to be held.

Temporary officers were elected as follows: President, B. S. Fuller; vice-president, A. G. Nyquist, Chevrolet Motor Co.; secretary and treasurer, E. E. Layden, Minneapolis Nash Co. Five men were elected to serve temporarily on the Board of Directors. These included Mr. Fuller, Stanley Boand, Hupmobile; C. M. Kingdon, Franklin; C. J. Briscoe, St. Paul, Nash; and W. G. Heitmiller, St. Paul, Hudson.

Among others present were Archie Williams, P. J. Downes Co.; R. S. Andrews, Elgin; H. E. McKammon, Auburn; F. C. Anderson, Franklin; Harry Holmes, Standard; A. W. Krall, Oakland, and B. M. Ikert, editor MOTOR AGE.

It is the intention of the organization to meet every third Monday of the month and for the time being these meetings will be held in some dealer's salesroom in St. Paul or Minneapolis. Invitations will be sent to dealers and service men of cities like Duluth, Winnipeg, Rochester and others in the Dakotas and Montana, inasmuch as the organization is to be a proposition encompassing the whole Northwest, with the exception of the Pacific Northwest.

A constitution and by-laws were drawn up, which will be brought up again for final adoption at the next meeting, which is to be held Friday night, March 12. At this time meeting permanent officers will be elected. Under the present by-laws active members shall include those engaged in the service work on cars, trucks and tractors, and their dues shall be $10. Associate members include those in the service work of batteries, tires, etc., and while the dues are the same as for active members, associate members are not entitled to vote. Proprietary membership is extended to the concerns carrying on automotive service work and dues are $35. Any man connected with the service department of his establishment can, of course, become a member of the organization without his company having membership, but from the enthusiasm displayed at to-night's meeting, it seems quite certain that all the dealers of the Twin Cities will back the movement and join the organization. Especially is this true when it is explained to them that the motive behind the formation of the association has not the remotest semblance of a labor union.

Like all other service associations, the object of the Northwest Automotive Service association is to better service conditions not only locally, but over the entire country, or wherever automotive apparatus goes. It is to be hoped that the excellent example set by the service men of Minneapolis and St. Paul in getting together will be followed by men doing similar work in other cities. By doing this the job of building up service prestige over the whole country will be greatly simplified and benefits to dealers, service men and customers accruing therefrom will be realized just that much sooner.

Minneapolis S. A. E. Discusses Bearings

Representatives of Ball, Taper and Plain Roller Bearings Talk of Relative Merits—Little Time For General Discussion

MINNEAPOLIS, Minn., March 4.—The dinner meeting of the Minneapolis Section of the S. A. E. scheduled tonight for the discussion of anti-friction bearings resolved itself into a three-cornered battle participated in by representatives of the S. K. F. Industry Co., Inc., Timken Roller Bearing Co. and Hyatt Roller Bearing Co. The three types of bearings discussed were, ball, taper roller and straight or plain roller. F. J. Rider and J. B. Castino were the spokesmen for the S. K. F. organization, while the Timken and Hyatt products were explained by T. V. Buckwalter, and Otto William Young.

There was little time for a general discussion, the entire evening being devoted to talks and rebuttal by the speakers. Practically speaking no final decisions were reached and A. Wm. Scarrett of the Minneapolis Steel & Machinery Co. relieved the tension of the meeting by stating that to his mind the bearing question was greatly influenced by design and production of whatever piece of automotive apparatus the bearings were going into. Thus, a tractor, for example would be designated to ideally meet the requirements of ball bearings in all its parts. The same would be done for taper or plain roller bearings. In other words, any bearing type will give good service if working under the right conditions and these conditions must be laid down on the boards of the car, truck or tractor designer along with the bearing maker.

In his talk on ball bearings, Mr. Rider emphasized the point that the non-adjustable feature of radial ball bearings with the correct clearance between balls and races set at the factory made them especially desirable for use in automotive equipment, as once installed they need no further attention other than lubrication. He also brought up the subject of internal friction, wherein he purported to show that the ball bearing was less troubled from internal friction than a roller type bearing, owing to the spot contact of the former and its ability to rotate in any direction.

Some discussion centered around the subject of friction in bearings.

New Orleans Opens Its Fortnight of Displays

Passenger Cars Hold Sway for First Week and Commercial Vehicles Will Follow

NEW ORLEANS, La., March 9—The 1920 auto show, held by the New Orleans Automobile Dealers' association, which opened March 8, and is to extend to March 17, attracted more than 150 exhibitors in the passenger car show, March 8 to 14, and the truck and tractor show, which ran from March 15 to 17, inclusive, as well as the equipment men, who maintained their exhibits throughout both shows. Approximately 100 models of passenger cars were shown, with twenty-five types of trucks and tractors, little attention being paid to the tractors, because of lack of space to care for all the exhibits, and some thirty-five to forty equipment exhibits.

The dealers association's show committee, of which L. C. Glenny is chairman, and A. H. Borden secretary-treasurer, was in charge of the show, with Henry B. Marks as director-general and Harry H. Dunn handling the publicity. A greater effort was made this year than ever before to attract the attention and attendance of the out-of-town dealer and motorist in all parts of Louisiana and Mississippi, by means of news letters to each of the 300 newspapers in the two states, as well as by advertising in the larger papers and bill-posting in all the towns of any size. The result of this campaign was that the attendance at the 1920 show was nearly double that of the 1919 show, when 25,000 paid admissions to the Athenaeum, where the exhibition was held.

Discussion is rife among the dealers as to the prospects for forming a stock company and constructing an auditorium large enough to hold the shows for several years to come, renting the building for conventions and similar gatherings when not in use for auto shows. It is believed the rental of such a structure would soon pay for it, and leave it a profitable investment for the dealers. The estimated cost of a suitable building, with the site, is $400,000, and with the 150 passenger car, truck, tractor, tire and equipment dealers in this city, it is believed there would be little difficulty in disposing of the stock. It is at least certain that a larger building will have to be provided before the New Orleans Auto Dealers' association attempt to give another show, so great has been the increase in interest in motoring in both Louisiana and Mississippi.

St. Louis Dealers in a Used Car Exhibit

Southern Hotel is Scene of Display Sponsored by Leading Distributors of Territory

ST. LOUIS, March 7—A used car show will be held under the auspices of the St. Louis Automobile Manufacturers and Dealers' association, March 8 to 13, in the Southern Hotel building, where a successful passenger car show was given two weeks ago. Space will be sold at 25 cents per sq. ft., as against 60 cents for the new car show. In addition to the dealers with whom used cars are a side line the exhibitors will include those who deal exclusively in them. The committee appointed by Pres. Phil H. Brockman of the association to take charge of the show is composed of George Weber, president Weber Implement & Automobile Co., Chalmers, Hupmobile and Maxwell distributor; James E. Newell, president Newell Motor Car Co., Stearns and Paige distributor, and J. D. Perry Lewis, president Lewis Automobile Co., Chandler distributor, and of the Cleveland-Lewis Automobile Co., Cleveland distributor.

As in other parts of the country, there is an extremely brisk demand in St. Louis for used cars from persons unable to obtain deliveries of new machines.

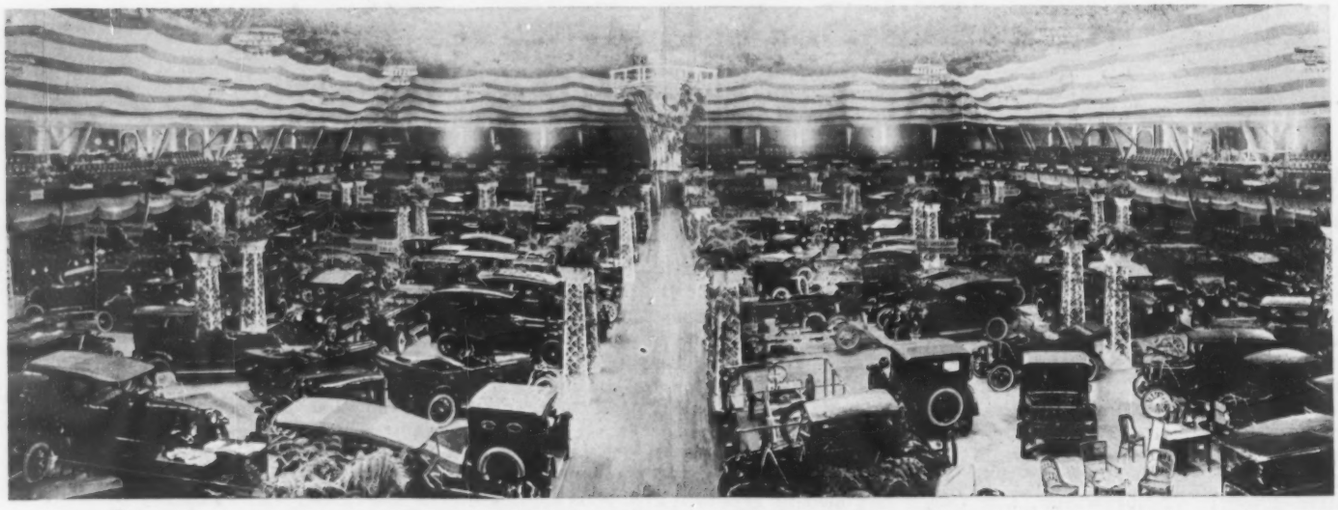
Service Is Featured at Buffalo Show

Despite Spacious Building, Exhibitors are Restricted in Allotments of Booth Accomodations

BUFFALO, N. Y., March 8—Service was given attention alongside merchandising activities of the Buffalo dealers incident to their eighteenth annual show. The exposition was held in the 74th Reg. Armory, which gave opportunity for more spacious exhibits than in the show hall of previous years downtown. The dealers took advantage of the additional space by showing, in many of the booths, at least, features stressing the maintenance of cars. Several dealers had their service managers on hand to discuss operation and maintenance problems with prospects instead of leaving it all to salesmen, according to the prevalent custom of past years at the majority of shows. Quite a number of exhibitors had cut-out chassis, with competent men to explain their operation, and others showed car parts on tables, and used men familiar with maintenance work to explain these exhibits.

Along the row in Buffalo dealers were found paying more attention than ever before to service. Edward H. Baker, president of the Buffalo Automobile Dealers' association, was working out a new efficiency system for his service station, stating that "in the past, in the automobile business, there has been too much making of sales at the front door and closing of sales at the back door." A number of Mr. Baker's fellow members of the association were reorganizing or expanding their service departments and enlarging stocks of parts, with a view of better service for owners in the city and the Buffalo territory, whose sales of cars and trucks last year aggregated $45,000,000.

The show, in which trucks were on the same floor with passenger cars, drew between 40,000 and 50,000.



Buffalo combined her exposition of passenger cars and trucks under one roof this year. The cars held central position in the hall, while the trucks were in the booths lining the ways. This photograph well displays the spaciousness of the Buffalo show

Omaha Draws Many Western Farmers

Interest in Trucks is a Big Feature of Nebraska Exhibition—Many Dealers in Attendance

OMAHA, March 8—Despite miserable weather which prevailed almost throughout its entirety, the annual Omaha Automobile Show this year experienced a tremendous success. Attendance was far above the record of last year while sales were correspondingly great. The show was staged by the Omaha Trades Association in the Auditorium, a building which proved all too inadequate for the large number of displays.

In an effort to get away from the stuffiness and dreariness which has been the result of decorative schemes in former years, the decorations this year were principally in white with a multiplicity of electric lights to bring out all the exhibits. The effect of this simple change was tremendous, declare dealers, and they point out that the sales of more than $500,000 in the first three days of the show prove their point.

Dealers from a large territory were attracted to the Omaha display. There were representatives from Nebraska, Missouri, Kansas, South Dakota, Wyoming and even Montana, all bent strictly on business, for the social features of the show were negligible, only a few of the larger distributors attempting to stage entertainments.

Passenger cars occupied the main floor of the building with the trucks in the basement. The relative inaccessibility of the truck displays did not seem to have much affect on the number of persons who made their way to the basement and the healthy interest taken in the commercial vehicles augurs well for the industry in this part of the west for the coming year.

BROOKLYN STARTS A SERVICE ASSOCIATION

Brooklyn, N. Y., March 8—With the tail end of the western blizzard lashing outside, fifty enthusiastic Brooklyn service men warmed things up inside the Long Island Automobile Club and proceeded to the formation of the Automotive Service Association of Brooklyn. Officers and members from the New York and Newark associations attended to assist in the organization. When it is considered that New York and Newark now have things going nicely and have the cream of the automotive service men in their respective fields and that the first meetings of these two organizations consisted of a mere handful of men, Brooklyn can be looked to to show some real speed in the association line.

While the two older organizations are almost exclusively devoted to the interests of the service men, it is expected that Brooklyn will alter the scope a little to include wholesale houses catering to service stations. The following were selected as temporary officers: President, G. T. McFarland, P. J. Durham Co.; vice-president, F. L. Bailey, Chevrolet Motor Co.; secretary, F. M. Smith; treasurer, H. J. Wechtel, Bolton-Wechtel Co. In addition to these officers a temporary Board of Directors was elected, and the officers and the board were instructed by the meeting to prepare a Constitution and By-Laws, Rules and other regulations and present these for adoption or amendment at a later meeting.

DERKS TELLS HOW TO SELL SERVICE

New York, March 8—Ernest V. Derks, Service Manager of the Buick Motor Co. of New York told the New York service managers how really to sell service at the regular monthly meeting of the Automotive Service Association of New York attended by about 100 members. Mr. Derks contended that the customer should be sold satisfaction and not a certain repair job that he wanted done. Ordinarily the customer would be under the impression that the station was trying to run up a bill, but diplomatic salesmanship would enable the station to sell an engine overhaul where needed when the customer only wanted his bearings taken up. The next meeting of the association on April 6 will be devoted to the subject of specializing mechanics especially as applied to Ford work. The speaker will be Frank J. Lowe, Service Manager of the Bronx County Auto Co.

ASK FOR UNIFORM ROADS

Cincinnati, O., March 8—The Cincinnati Automotive Trades association has started a movement to adopt a uniform type of road for all future road building in Ohio. Under direction of E. H. Silva, a committee will start immediately to gather data on road construction in all parts of the United States. As soon as this data can be analyzed, recommendations for a model type of road will be made to the State Highway Commissioner by the association.

FORD PRICES ARE RAISED

Detroit, March 4—Ford prices were raised $50 on open models and $100 on closed bodies, effective midnight March 3. The closed body price of $850 for coupes and $975 for the sedan is $200 in excess of the former prices, but the new figure includes full equipment, the demountable rims and electrical equipment having cost an extra $100 in the purchase of a car at the old price. The touring car now sells at $575, the runabout $550 and the chassis at $525.

Trucks also have been increased $50, the solid tire equipped truck now being $600, and the pneumatic tire $640. Tractors also have been raised to $850, a $100 increase.

NEW CASE PRICES ANNOUNCED

Racine, Wis., March 8—Effective today, following are the new prices on Model V six-cylinder Case cars; seven-passenger Sedan, $3750; four-passenger coupe, $3400; seven-passenger touring, $2650; four-passenger sport, $2650.

Tulsa Holds First of Southwestern Shows

Brisk Demand Shows Oil Capital is Eager to Get Motor Cars on Almost Any Terms

TULSA, Okla., March 8—Tulsa's Fourth Annual Automobile and Truck Show opened with a splendid attendance which continued throughout the week and the total, rolled up is greater than that of any previous Tulsa show. Oklahoma and adjacent states have sent thousands of visitors to Tulsa during the week and all hotels have been filled.

Talks with nearly every dealer exhibiting passenger cars or trucks reveals that many sales have been made during the week, the buyers in several cases demanding immediate delivery before the end of the show. Special body jobs were in evidence in many exhibits, on both cars and trucks. Notable among these were the Packard, Daniels, McFarlan, Elgin and Roamer cars and the Reo, Gary and Pierce trucks. Among the special truck jobs were special oil field bodies and powerful winches for pulling rods from oil wells.

The Tulsa Automobile Dealers' Association believes in putting on a show right. The decorations include costly oriental rugs, art lamps and tapestries. Entertainment features consisting of an orchestra, a jazz band, a quintette of native troubadours and a mixed quartette were intermingled with the selling talk.

The principal dealer meeting of show week was held at the Tulsa Hotel in the form of a luncheon. The meeting was presided over by the Mayor of Tulsa and was honored by an address of welcome by Gov. Robertson. Edward S. Jordan, president of the Jordan Motor Car Co., who recently returned from a trip of investigation to Europe. The chief topic of Mr. Jordan's address was the impending shortage of cars and how dealers will best prepare themselves to meet it.

The Tulsa show has shown that people in and adjacent to the oil capital of the world have plenty of ready money and they are willing and anxious to invest it in motor vehicles if they can get them. Exhibitors of accessories and garage equipment are in accord with the motor car and truck dealers in saying that this 4th annual show is the best ever held and plans are already going forward for next year's show.

PLAN TO CURB RECKLESS DRIVING

Atlanta, Ga., March 8—The Georgia Automotive Dealers' association has adopted a resolution looking toward the rigid enforcement in this state of the laws governing reckless auto driving. The association urges that the numbers of all cars be taken where the drivers prove reckless and that rigid prosecution be made the keynote in putting a stop to this malpractice. The association will lend its aid to the state and local officers in the prosecution of such cases.

Philadelphia Truck Tours Set for Week of May 17-24

PHILADELPHIA, March 7—The proposed farm tour of motor trucks, trailers and tractors will be started from Philadelphia on May 17, continuing till May 24. This was decided at a meeting of the proprietary members of the Motor Truck association of Philadelphia.

During that period there will be held 65 similar tours, starting from nearly every large center, throughout the United States. It was decided to appoint a committee to handle the details of the Philadelphia tour and to make an assessment of $50 on each entrant to cover incidental expenses.

J. P. Cranston, vice-president of the association, presided at the meeting. W. H. Metcalf read the plan outlining the tour, as proposed by the "Ship-By-Truck" management and the National Association of Sales Managers.

G. H. Kiley, who was advance agent for the 60-day farm tour in the middle west last fall, explained to the members the details of conducting such a tour and offered to supply the necessary men for conducting it, without cost to the association for their work. Charles C. Bulkeley, manager of the "Ship-By-Truck" bureau, reviewed the advantages to be gained by the enterprise.

Representatives from eighteen motor truck dealers and distributors attended the meeting, in addition to several representatives from local trailer, tractor and accessory concerns.

The proposed tour will extend through southeastern Pennsylvania, southern New Jersey, Delaware and eastern Maryland—in fact, through what is known to the local trade as the "Philadelphia district" of distribution. The governors of these states have signified their willingness to co-operate. Governor Sproul, of Pennsylvania, announced that he will make an address at the opening of the tour here.

New York, March 9—Rumors are current that the General Motors Corp. has purchased the entire John N. Willys interests for a sum reported as $90,000,000. The report has been denied.

(Latest financial statements of the Willys-Overland company for the fiscal year of 1918-1919 showed a net income of more than $5,500,000. As it is expected the net income for 1919-1920 will be about double that for the preceding year and as the Overland company is only a fraction of John N. Willys' automotive holdings, the rumor evidently was due to someone's brainstorm.)

TO FINISH DELAWARE HIGHWAY

Wilmington, Del., March 8—The Delaware State Highway Department expects to have the state highway, from one end of Delaware to the other, 100 miles, with a number of connecting roads, completed by the end of this year. Much work was done last year, when the real start was made and additional contracts will be let in March for large projects this year.

In order to distribute the traffic over the new roads, the Highway Department has arranged to keep the roads free of snow in winter, as far as possible, at all events where there is heavy traffic. The roads are policed also, to prevent excessive speeding and other abuses.

HUDNALL WITH FLORIDA DEALERS

St. Louis, March 7—B. B. Hudnall, until March 1 assistant general manager of the National Automobile Dealers' association, has resigned to become secretary of the newly organized Florida Automobile Dealers' association.

ASKS $500,000,000 MORE FEDERAL AID MONEY

Washington, March 8—Additional appropriations of $500,000,000 for highway construction would be made, if a bill introduced by Senator Chamberlain is approved. The bill would appropriate $100,000,000 for the fiscal year ending June 30, 1922 and a like sum for the fiscal years 1923, 1924 and 1925. In addition, it would appropriate $10,000,000 for each fiscal year beginning with June 30, 1922 and ending with June 30, 1931, for national forest roads and trails. All appropriations would be placed under the Department of Agriculture, and are to be expended on a pro rata basis with State expenditures, under the Federal-aid Road Act.

A provision in the bill is to the effect that when the Government of the United States owns more than 10 per cent of the land in any one State, the Secretary of Agriculture may reduce the ratio of state co-operation, but not to less than one-half of that proportion which the total Government land bears to the total area of all lands in the state.

Another provision declares that all projects should preferably expedite the completion of an adequate national highway system.

CANADA IMPORTS 10,000 TRACTORS

Ottawa, Ont., March 6—More than 10,000 tractors were imported into Canada in 1919, according to figures furnished by the Department of Trade and Commerce. The passenger cars imported totalled 9367 and trucks 21,113. The cars were stated to cost $9,304,235, and the trucks $3,437,464.

The exact number of tractors admitted through the customs is 10,092, valued at $10,647,557. It is interesting to note that only 317 were valued at more than $1,400.

Kentucky Plans Ambitious 1920 Road Building Program

FRANKFORT, Ky., March 2—The most ambitious good roads program ever undertaken in Kentucky has been well launched on its course through the Kentucky Legislature as an administration measure and bids fair to become a law before the Legislature adjourns its present session.

Calling for an expenditure of $50,000,000 within the next ten years, thereby giving Kentucky 3000 miles of modern, new highways, the bill passed the House by a vote of 2 to 1 and this week was passed by the Senate.

Several amendments, however, were added in the Senate, these being principally in the form of additional improvements, and the bill will be returned to the House again for passage there. It is likely that it will go to Conference Committee for adjustment of the amendments, but its passage virtually is assured, it is said by legislators.

The bill establishes a primary system of state highways which will give to each county in the state at least one main thoroughfare and which sets out sixty projects extending from the Mississippi river on the West to the Virginia line in the East and from the Ohio river on the North to the Tennessee line on the South.

The bill provides also for the formation of a State Highway Commission of four members to be appointed by the Governor from the two dominant political parties and appointment by the commission of a State Highway Engineer at a salary of $5000 a year.

With this bill will be passed companion bills, designed to raise funds to carry out the vast undertaking. Since the question of funds sufficient to meet the tremendous expense is of paramount importance, much consideration has been given to revenue raising measures.

A large part of the money needed for the first part of the program is expected to come from a whiskey tax on liquor remaining in Kentucky warehouses. A 50-cent tax on each gallon is provided in a bill introduced by Representative J. Wood Vance and this bill has passed the House with only four opposing votes.

The bill will bring in an estimated total of $17,000,000 to $20,000,000, of which three-fourths will go to the good roads program and the remaining one-fourth to the State Fund. It is expected that $750,000 will be derived annually from the race tracks; another million dollars annually from licenses on motor vehicles and approximately $750,000

a year from a tax on gasoline. In addition to these sums, the Federal Government will make a large appropriation under the provisions of the State Aid law.

Several Kentucky counties already have undertaken ambitious good roads' programs on their own initiative, with the assistance of State and National funds, and are rapidly putting into service a system of good roads. These are in the main a system of dirt roads, however.

BROWN-LIPE TO EXPAND

Wilmington, Del., March 8—At the request of the General Motors Corp., the duPont Engineering Co. of Wilmington has arranged to assist the Brown-Lipe-Chapin Co. of Syracuse, N. Y., in the latter's new construction work, consisting of an addition, five stories in height, to its factory and including an entirely new powerhouse, loading dock, etc. The cost of the new construction will be from $800,000 to $1,000,000.

The Brown-Lipe-Chapin Co. manufactures automobile differentials, and the output of the proposed plant extension will be for the General Motors Corporation, which now takes more than 50 per cent of the production of the company. It is intended to have the new project completed by next September.

KIKEN BUDA SERVICE MANAGER

Harvey, Ill., March 8—R. A. Kiken has been appointed service manager for the engine division of the Buda Co. Mr. Kiken has been with the Buda since 1910.

Lake Charles Opens Houses to Louisiana-Mississippi Dealers

LAKE CHARLES, La., March 7—With approximately 350 reservations already received by the committee in charge of the convention of the Louisiana-Mississippi Automotive Trades association convention here March 17-18, the committeemen have decided to abandon hope of having enough hotel accommodations to care for the 600 to 800 auto dealers, truck and tractor dealers, equipment men, good roads enthusiasts and motorists who will be here on those dates.

To care for these guests, the committee has succeeded in having the homes of the city thrown open to them, and provision already has been made for the care of approximately 500 of the visitors in private residences. The indifferent attitude of the hotels, and the exorbitant rates charged for mediocre accommodations first gave the Lake Charles Automotive association, under the leadership of T. L. Huber, the idea of going into the homes, and their efforts, coupled with those of the Lake Charles Association of Commerce, met with such a ready response from the people that the crowd will be cared for even better than in the hotels.

A central telephone exchange will be opened, connecting with each one of the homes in which one of the motor men has been taken, and his call to this central will result immediately in a car being sent for him, no matter where he is. 350 automobiles have been offered for this purpose, so that the quick and comfortable transportation of the city's guests is assured for both days of the convention.

Speakers of national reputation in the automobile industry and in the good roads movement will address the convention each day. One of the features of the gathering will be a series of round-table discussions on problems affecting the industry. There will be separate discussions for the passenger car dealer, for the truck dealer, for the tractor dealer, for the equipment man, for the good roads builder, for the motor-car owner, the tire man, the battery man, and all other branches of the trade. These discussions will be led by recognized leaders in the various branches from distribution and service centers of both states, and will furnish a clearing house of ideas for the trade and the customer as well.

NO WONDER YOU SEE SO MANY!

Detroit, March 8—Production of the Ford Motor Co. for the first seven months of the fiscal year of 1919-1920 totalled 557,372 cars. Despite this big figure, which will bring the year's total to about 1,250,000 if the present average is maintained, the Ford company had, on Feb. 10, 223,492 unfilled orders on its books.

In addition to the passenger cars, Ford plans to build 150,000 trucks in 1920.

Cleveland Service Men Form Association to Improve Industry

CLEVELAND, March 6—The idea of forming Service Managers' associations is rapidly spreading over the entire country. On Thursday evening, February 26th, the Automotive Association called together the service men of Cleveland and asked them to form an organization and become identified with the Automotive association. About twenty-five service managers attended and perfected a temporary organization, electing O. T. Hillshafer of the Chandler Motor Car Co. as temporary chairman. They then decided that it was necessary to hold another meeting on Thursday, March 11th, and endeavor to get the balance of the service managers to this meeting. For that purpose a committee was appointed to call on each service manager not present at this meeting and urge his attendance at the March 11th meeting. This committee consists of A. O. Williams of the Bissinger Magneto Co., H. H. Newby of the Simmons Motor Car Co., and H. M. McNamara of the Hinkle Motor Truck Co. Dale Brown of the Chamber of Commerce was elected temporary secretary and immediately announced that Ralph C. Rognon, service manager of the Brockway Motor Truck Co., Cortland, New York, would address them at a meeting of service managers on Wednesday, March 17th.

The enthusiasm shown at the meeting was marked. Not a man present voiced any but favorable sentiment toward a service managers' organization which each believed was not only a good thing but an absolute necessity to the further progressive development of the automobile industry.

The addition of Cleveland makes a total of five service associations in the large cities.

SERVICE MEN ON A JAUNT

Wilmingon, Del., March 8—In order to get first hand information, managers of the five service departments of the Bethlehem Shipbuilding Corp., Ltd., one of which is located here, leave Monday for a trip in the motor district in the middle west, which wil last several weeks.

They will visit the Ford and Packard plants at Detroit, the International Harvester Co.'s works at Chicago, the plants of the Akron Rubber Co., Goodrich Rubber Co. and Firestone Rubber Co., at Akron, O.; the Cleveland Twist Drill Co., and the Cleveland Steel Co., at Cleveland, O.

WILL TRY TO CONSERVE FUEL

New York, March 8—A flat rate for carbureter adjustments for all service stations associated with the National Automobile Dealers' association is recommended by the gasoline conservation body representing that organization and the National Automobile Chamber of Commerce. The recommendation is one of several made by the national bodies in their effort to conserve fuel.

The general upward trend of crude oil prices, bringing advanced gasoline prices, is the cause of the fuel conservation movement. Through the dealers' association and through the instruction books issued by manufacturers, owners will be asked to save as much as possible and carbureter adjustments will be recommended as a step in that direction.

PURITAN BUYS A.B.C. STARTER CO.

Detroit, March 7—The Puritan Machine Co. has purchased the A.B.C. Starter Co., manufacturer of electric starting and lighting equipment for Ford cars. All stock, tools, dies, jigs, blue prints, etc., covering A.B.C. equipment have been moved to the Puritan plant, from which point service parts and repairs to equipment will be handled.

Little Rock Shows Two Home Products

Curtis and Climber Are Features of Arkansas Displays—Truck Benefit by Good Roads

LITTLE ROCK, Ark., March 4—For the first time in the history of an Arkansas automobile show, two models made in the capital city of the state are being exhibited. These cars are the Curtis Six, manufactured by the Curtis Motor Car Co. and the Climber Four, put out by the Climber Motor Corp., both of Little Rock. The 1920 show outstrips anything ever attempted locally. Liberty Hall, where it is being staged, was enlarged to accommodate the ever increasing number of cars being sold in the state, and all in all there are 170 passenger cars and trucks being exhibited.

Outside of the fact that an automobile show is always a big drawing card in Little Rock, there stands the unusual feature of this year's exhibit of an unheralded interest on the part of the farmer in the motor truck and its possibilities. Arkansas, in the past has been a bit behind, in the use of trucks on her farms. From the looks of things at the present show, this condition will not long exist. With a good roads program of approximately $100,000,000 now under way, the farmer is beginning to appreciate the possibilities of the truck and good roads combination. Dealers at the show report a steady increase in interest on this point. While the farmer is casting one covetous eye on the beautiful models of pleasure cars, he is casting the other on the sturdy, high powered trucks which mean more money and better markets to him.

ATLANTA GETS TRACTOR SHOW

Atlanta, Ga., March 5—One of the biggest tractor and implement shows in the country will be held in Atlanta this spring if plans of the newly organized Atlanta Tractor and Implement Club materialize.

Diversification of crops in the South as the result of the depredations of the deadly boll weevil have created an enormous demand for modern farm implements. The South has become, in fact, during the last three years, the most productive center of the nation in agricultural products.

The Atlanta Tractor and Implement Club plans first to bring together executives of the big implement companies at a national meeting here, this meeting to serve as a forerunner to the tractor and implement show. Definite plans for these projects wil be made in the near future.

SCRANTON HOLDS BIG SHOW

Scranton, Pa., March 7—Automobile dealers who have cars in the motor car show which will be held in the Thirteenth Regiment Armory all this week, say that they believe the season of 1920 will be a record-breaker, based on the number of prospects they have indexed on their cards. They assert that never have they had more prospective buyers on the eve of a show. Every legitimate dealer in the city has at least one car entered. Philadelphia as well as local firms are represented on the accessories list for the show.

Dealers assert that they are still unable to keep up with the demand for cars, but are hopeful, now that the railroads have been returned to private ownership, that shipping conditions will improve in about a month or two. The manufacturers have informed dealers and distributors that they are now virtually on a pre-war basis again as regards plant equipment, if not labor, and that during the interim between the normal traffic of the railroads and now, the weather doubtless will be such as to permit driveaways in many cases.

CHICAGO TRADE MEN MEET

Chicago, March 8—Members of the Chicago Automobile Trade association held their annual meeting and election tonight at the Congress hotel. The meeting took the form of a banquet which was attended not only by members of the association but by their employees as well.

Following were the officers elected for the coming year: L. A. Peil, president; C. R. Dashiell, vice president; R. C. Cook, secretary; Thomas J. Hay, treasurer; James Levy, Ward S. Perry and John Nicol, directors. H. P. Branstetter and C. E. Gambill are the hold-over directors.

HANDLEY-KNIGHT BUILDS FACTORY

Kalamazoo, Mich., March 8—Work will start immediately on a big factory for the Handley-Knight in Kalamazoo. The main building will be 80 by 100 ft., and is expected to be ready by June 1.

Denver Stages Show for Rocky Mountains

Big Attendance and Business Are Reported Much Larger Than Last Year

DENVER, March 8—Denver staged the Rocky Mountain district's annual motor car show last week and from accounts of all exhibitors, the Rocky Mountain country is going to contribute just as much to the big prosperity of the industry as any other part of the United States. Denver's show is a little later in the year than those of some of the other parts of the United States, but it makes up for its tardiness in its completeness and the big amount of business annually transacted there.

This year's show was nearly 50 per cent greater than last season's, the exhibits taking up 82,000 sq. ft. of floor space as compared with 54,000 last year. There was a total of 270 exhibitors and more than 300 models of passenger cars were displayed. It is estimated that more than 2,000 dealers from the territory contributory to Denver attended the show and its importance as a business proposition is attested by the fact that more than 1000 factory representatives were in attendance.

Retail sales were quick, the first being recorded just one minute after the doors had been thrown open. Retail sales, however, were not the only thing the show brought out, for the large dealer attendance shows that the Denver distributors are going to have their hands full supplying their dealer organizations with enough cars and trucks to satisfy their demands. The problem now is to get the cars and all sorts of schemes are resorted to.

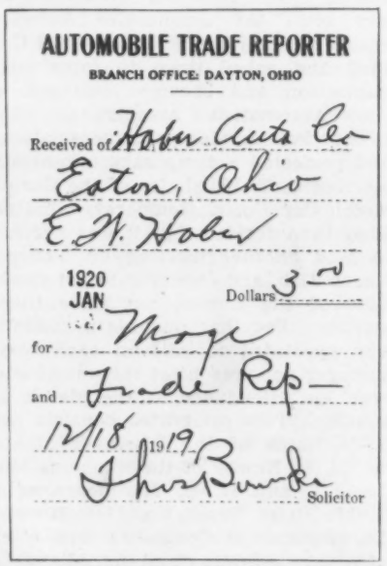
The Swindler Again

We doubt whether there is another business so infested with parasites who continually prey upon its customers as the publishing business.

Herewith is printed a reproduction of a receipt being used by a swindler who changes his name apparently as often as he issues these bogus receipts.

The last complaint MOTOR AGE has received came from Ohio and told how this bogus subscription agent offered a subscription to the Automobile Trade Reporter (which, as far as we know, does not exist), and an electric lamp as inducements to all who became subscribers to MOTOR AGE. In addition to the name of "Bourke" he has used other aliases such as Walker, Goode, etc. Yes—a few fell victims, and, worst of all, several of our regular subscribers.

Let's get together and drive these pests out of our field at least. If you are approached, let these fakirs tell you what they have to offer and when they offer premiums, cut rates, other publications, etc., you can brand them as frauds. Get the police on the phone and prefer charges against Mr. Fakir as recommended by your police officer, and—telegraph MOTOR AGE.



AUTOMOBILE TRADE REPORTER

BRANCH OFFICE: DAYTON, OHIO

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E. H. Haber

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12/18 1919

Thos Bourke Solicitor

Express Strike Ties Up Service Work

Chicago Distributors Unable to Ship Replacement Parts to Dealers in Smaller Cities

CHICAGO, March 8—Service work of dealers supplied by car distributors for the Chicago territory is likely to be hard hit by the strike of express handlers and clerks which was called in this district Saturday. While it is as yet too early to learn just how badly the automobile dealers are hit by the strike, it is believed that they will be severely affected before the conflict is settled.

Express handlers in the Chicago terminals went on strike Saturday morning, March 6, despite orders from their national union to stay at work. It is estimated that about 80 per cent of the men employed in the Chicago yards and offices preferred to take the strike order from their local to the non-strike order from the national lodge and before the day was done the American Railway Express Co. was obliged to issue an embargo order on express. Automobile parts and supplies were put on the list of shipments which would not be accepted for shipment either to or from Chicago.

Belief is expressed here that before the controversy is settled, the express strike will spread to Detroit, Indianapolis, Cleveland and other centers of the automobile centers. If this is correct, service work throughout the United States will be hit, for only a few of the larger distributors and branch houses carry a sufficient large supply of replacement parts to last any considerable length of time.

As far as Chicago is concerned, the real effects of the strike will not be known for a week or more. It is the policy of the larger Chicago distributors to carry supplies of replacement parts sufficient to last them and their dealer organizations for a considerable length of time, so it is not likely that these will be exhausted before the strike is settled. It is a different matter, however, for the dealer of the smaller cities ordinarily supplied by the Chicago distributors. These dealers do not ordinarily carry any considerable stocks of replacements, relying upon their Chicago distributors to supply them as needed.

For smaller parts, distributors have taken recourse to parcels post delivery but of course this cannot be utilized for larger replacements such as axles, etc. As the roads around Chicago are not in the best of condition, sending these larger parts by motor truck express will be difficult.

HUTCHINSON SHOW MARCH 24

Hutchinson, Kan., March 8 — The Hutchinson Automobile show has been scheduled for March 24 to 27, under the auspices of the Automotive committee of the Chamber of Commerce.

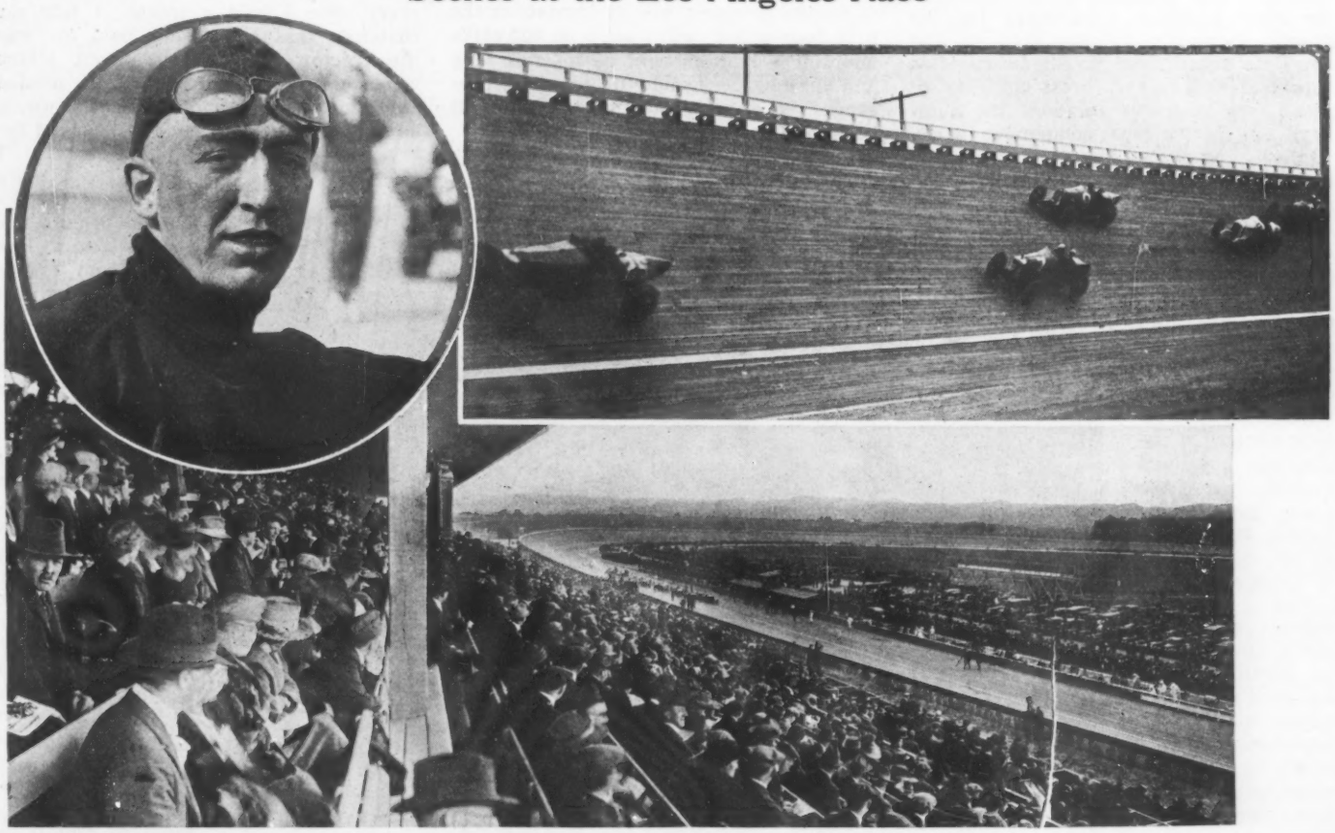
N. A. C. C. Organizes Service Men's Bureau

Formal Recognition of Importance of Manufacturers is Given by Manufacturers

NEW YORK, March 8—The National Automobile Chamber of Commerce at a meeting held recently voted for the establishment of a service managers' division to function for that department along similar lines to the foreign trade, patents, traffic, legislative, highways and other departments. H. R. Cobleigh has been placed in charge of this new division. It is the intention of this new division to arrange for meetings or conventions of factory service managers, planning programs, securing authors for papers and discussing topics of interest and value. It will be remembered that the first factory service managers' convention was held in Detroit in November of last year and the action of the Chamber a few days ago is simply carrying out the ideas promulgated at that meeting. Many activities will be fostered and bulletins will be mailed to service managers calling their attention to practices needing correction, policies worthy of universal adoption and special efficient systems in use by certain factories.

Following the success which attended the visits to member factories at the Detroit convention it is planned to continue

Scenes at the Los Angeles Race



A crowd estimated at from 40,000 to 50,000 persons watched Jimmy Murphy pilot a Duesenberg car to victory in the inaugural race at Beverly Hills track. In the circle is Murphy, the victor

such visits and to prepare publicity material to further the efforts of factories to furnish satisfactory service.

The Chamber will co-operate to the fullest possible extent with the National Automobile Dealers' Association, Motor and Accessory Manufacturers' Association, other national associations and the Motor Transport Corps on all matters pertaining to service.

The Chamber will be of material assistance to branches and dealers by encouraging and assisting in the establishment of local organizations, of dealer and garage servicemen.

USE RANGERS TO ENFORCE MOTOR LAWS

Austin, Texas, March 7—If the recommendations of the executive committee of the Texas Law Enforcement Association are adopted a special company of State Rangers will be organized under the direction of Gov. W. P. Hobby for the purpose of enforcing the highway and automobile registration laws and running down automobile thieves. In submitting the recommendations the executive committee declared that automobile thefts were intercounty and interstate in nature and that a state organization had many advantages over county officers in dealing with this class of crime. In this connection a state bureau of identification will probably be established.

This bureau will classify all finger prints sent in by local officers and trace the previous records of all persons arrested on suspicion or in connection with crimes. The creation of a bureau in the state highway department for the special purpose of keeping accurate and complete descriptions on all automobiles reported stolen, and cross-indexing of these cars by motor numbers, the numbers on the various component parts, highway numbers, the makes of cars and by detailed special identification marks, is proposed.

Gov. Hobby announced that he stood squarely behind the movement and that it would have his enthusiastic support if the program outlined should have the approval of the attorney general as to the legal phase of the matter.

The executive committee also asked the governor to recommend to all commissioners courts and to the governing boards of all incorporated municipalities that equipment be purchased fitting with the central bureau requirements.

Cincinnati Dealers Lose Chance to Finance Garage

CINCINNATI, O., March 8—Plans of city officials to request Cincinnati motor car dealers to finance a large, public garage and plans of the Cincinnati Automobile Club to erect a seven-story building and garage of its own, were upset this week by the announcement that a group of Cincinnatians, backed by outside capital, will erect a six-story, concrete public garage in downtown Cincinnati at a cost of $1,250,000. It will have a parking capacity of 2,500 cars.

The projected garage will meet the emergency that will arise when City Council legislates automobiles from parking in the business district, a step that is now assured. The Automobile Club is considering an offer to establish its new quarters in the building.

According to W. T. Calerdine, spokesman for the interests backing the project, the plans have been approved and construction will start within 30 days. No information has been given out as to the identity of the financial interests involved, but they are believed to be automobile men from outside of Cincinnati.

The building will be the first of its kind in the South and will be patterned after public garages in Cleveland and New York, except that no stock will be offered for sale.

Accessory stores will be located on the first floor and a repair shop on the sixth floor. The building will be 200 feet long and 300 feet deep and will have two passenger elevators. Parking charges will be nominal.

Public garage space in Cincinnati has long been overtaxed, even with street parking permitted, and passage of parking ordinances have been withheld only because there was no place for automobiles to park. City officials had made arrangements to call motor car dealers into a conference and ask them to finance such a garage as now is assured, to meet the emergency, but this development makes that step unnecessary, it is said.

NEED LICENSES TO TRADE IN USED CARS

Philadelphia, March 7—According to an opinion rendered by Deputy Attorney General Robert Gawthrop, chartered automobile companies are subject to all the regulations of the laws of 1919, which require special licenses to trade in used cars. The opinion states that the act is an exercise of police powers of the state and that corporate charters are granted subject to the police power of the state. The opinion authorizes the State Highway department to proceed against all motor car concerns which have refused to take out licenses permitting them to trade in second-hand cars.

HE MAKES HIS SERVICE PAY

Shelbyville, Mo., March 1—"I expect to make my money off my service," says E. M. Smoot, Ford and Fordson dealer at Shelbyville, Mo. "You see, I've got only a little territory, just about fifteen miles square. Last year I put fifteen Fordson tractors and equipment into it. No, I didn't make much money on them. But every time I sold a tractor I told my customer that all he had paid for was the tractor and the equipment which went with it. If afterward he needed anything in the way of service he would have to pay for it, because I charged for all the service I gave. I get more and more tractors and tools onto the farms there will be more and more service to give and I shall make money from that.

"I've got a little scheme running now which is rather out of the way. It happened that once in a while one of my customers would have to leave his car in my shop two or three days while it was being fixed or overhauled and I got the notion into my head that maybe he would like to have a car to use while he was laid up. So I took a stock car and offered to rent it to my customers at $6 a day. I didn't

A Successful Adventure in Utopia

The motor car is employed in serving the co-operative colony at New Llano, La., with bakery goods

much think any of them would pay that, but as a matter of fact the scheme made a hit and now I have five cars which are out most of the time at $6 a day."

HARDWARE MEN TO HANDLE ACCESSORIES?

Cincinnati, O., March 8—Hardware men of Ohio were urged to expand their sales in the automobile accessory trade, because of the ever-increasing demand for automobile parts, in an address by A. H. Vayo, sales manager of the Eclipse Manufacturing Co., Indianapolis, before the Ohio Hardware association convention, which was held here recently.

Not only is there more profit in the automobile accessory business than in the ordinary hardware business, Mr. Vayo said, but the accessories are a big part of the hardware business and are not limited to garages and specialty houses.

The handling of automobile accessories can be done without adding much to the already existing overhead expense.

FIGHT LICENSE INCREASE IN INDIANA

Indianapolis, March 7—The Hoosier State Automobile association has come out strongly against a 100 per cent increase in automobile license fees in Indiana. It has been suggested that such action be taken in the proposed special session of the General Assembly being planned by Gov. Goodrich, the calling of which is being opposed even in the Republican party. The reason for this increase is the provision of funds for continuation of the road construction program adopted last year for 1919-1920. The automobile organizations are complaining of heavy tax already directed at the motor car owner, who pays a 5 per per cent tax on his new car and accessories, a personal property tax and the annual state license fee. The automobile organizations have proposed a four-mill levy for the State Highway Commission, based on the new tentative valuation in the state. This, it was said, would raise about $20,000,000. The inheritance tax, plus a $5,000,000 Federal aid fund now available, would give the state approximately $30,000,000 for road construction work. The plan is for the fixing of this levy by the special session of the legislature, if called, the money to be collected during the latter part of 1920.

Maryland Dealers' Body Fights New Motor Car Laws

BALTIMORE, Md., March 8—The Baltimore Automobile Dealers' Association is leading a really active life these days and is showing more activity than at any time in its history.

The big point in the association's activity just now is in safeguarding the interests of the motorists of the state in the various measures that are before the General Assembly of Maryland, which is in session just now. The association is opposing the following bills:—

To reduce the age limit for drivers of motor vehicles from 18 years to 14 years. This bill has been amended to 16 years and the association is still opposing the new age limit on the ground that it is unsafe.

Opposing the abolishing of the office of Commissioner of Motor Vehicles of Maryland.

Opposing the change in the provision of the present motor vehicle law, which has to do with the ownership of motor vehicles.

Opposing the bill, which provides for the abolition of the use of the spotlights.

Opposing the bill, which makes it necessary for the Public Service Commission to issue license for a passenger line for motor vehicles whether a need for the line exists or not.

Opposing the bill, which will make possible the creating of a motor truck freight line whether a need exists for the line or not.

The association has sent out letters to every dealer in Maryland whether they are members of the association or not calling upon them to aid them in their fight to prevent the enactment of legislation, which will prove to be detrimental to the interests of motor dealers and to the public as well.

The association has also planned the expenditure of $5000 to improve the clubhouse on Charles street. The new improvement will include the installing of gas logs in open fireplaces in various rooms in the headquarters, the refurnishing of the Board of Directors' rooms and the refurnishing of the members' reading rooms and parlors.

LAFAYETTE DELIVERIES IN JUNE

Indianapolis, Ind., March 8—LaFayette Motors Co. will start production in May and deliveries in June, in line with their schedule. All fear of a delay in production has been dissipated by the rapid acquisition of a force of skilled mechanics and automobile workers, many of whom left other automobile plants voluntarily, in order to hook up with the LaFayette organization. Many of them have had valuable experience in airplane engine shops, government aviation camps and French flying fields.

U. S. TESTING ROAD MATERIALS

Washington, March 7—An important road testing experiment is being conducted by the Bureau of Public Roads on the Arlington farm which is owned by the Department of Agriculture, where a forty-nine section roadway with each section constructed of different material or constructed differently, is being studied. The same wear and tear is given to each section, so that eventually the type of construction best suited to heavy traffic will prove itself. This information was announced by the Bureau at the conference now being held here of state engineers, who are endeavoring to standardize road materials and road construction.

One state engineer recently declared that millions of dollars in his state are involved in the proper design or road surfaces, which make up one of the problems being investigated by the Federal engineers.

The coming into general use of the heavy motor truck has practically revolutionized the science of road building. Big new problems came when loads weighing 10 to 15 tons took the place of vehicles that placed a weight one-fourth as much or less.

Something New in Sleds

Motor cars mounted with runners are what the bored editor classes as old stuff, but this is the first time we've seen the skating motorcycle

Portland Stages Show for the Northwest

Closed Car Models Show a Marked Popularity in Great Oregon Exposition

PORTLAND, Ore, March 8—This city's eleventh annual automobile show, just ended here, was by long odds the most successful automotive event that has been held in the Pacific Northwest. More cars were entered, attendance was greater and interest keener, and sales exceeded in volume those at any previous show.

This applies particularly to the passenger car show at the Ice Palace. For the first time in this part of the country a separate truck show was held at the same time, in the Portland Armory, one ticket admitting visitors to both. Attendance at the passenger car show in the Ice Palace, totaled 28,648, and for the combined shows 39,627.

A total of sixty-eight different makes of cars and 166 models were displayed in the Ice Palace, and in the truck show at the Armory were thirty-five makes of trucks, four tractors and forty-three different models. Several of the leading truck distributors did not enter the truck show at all, their view being that a truck demonstration run through the Willamette valley sometime this coming spring or early summer would be far more valuable to them. Such a tour is almost certain to be made.

One notable feature of the Ice Palace show was the interest taken in closed car models. The Oregon territory has long been noted for a peculiar aversion to closed cars. Until the past two years it was about all dealers could do to get rid of closed cars under any terms, that they were forced to take in their allotments from the factories. The longest kind of long trades, almost any old deal, in fact, was welcomed if it gave an opportunity of getting rid of a closed car.

But a campaign of "selling" the public to the advantages of closed cars begun in earnest about two years is now bearing ripe fruit. The extent to which it has taken was demonstrated in the fact that about a third of the retail sales at the show, taken by and large, were of closed cars. Just about that proportion of closed car models to open cars were displayed at the show.

READING BOOSTS SHIP-BY-TRUCK

Reading, Pa., March 8—Large crowds patronized the passenger car, truck and tractor show held by the Reading Automobile Trade association. Exhibiting dealers report numerous sales from the floor and farmers, especially, were purchasers of motor trucks, even more interest being shown by them in these vehicles than in farm tractors.

At the show most of the truck exhibitors encouraged the "Ship-by-truck" slogan and the usual form of large printed disks containing this slogan appeared on most of the windshields. No immediate deliveries were promised by exhibitor-dealers making sales from the floor. Several of their customers are from nearby rural sections. In truck lines increasing interest was manifest over the number of departures in construction, particularly in heavy duty trucks. There was also considerable comment on the apparent switch in public favor, to pneumatic tires.

A Glimpse of the Portland Show

Closed cars showed marked popularity in what is declared the most successful event ever staged in the Pacific Northwest

PLAN TO RAISE MONEY FOR ROADS

Louisville, Ky., March 8—Administration support has been given by Gov. Morrow to various bills designed to raise money for state highway construction, projects to the amount of $5,000,000 for which are to be laid out by July 1 in order to take advantage of $2,500,000 Federal Aid money. The bills, which are opposed by the Louisville Auto club would place a tax of one cent per gallon on gasoline, 60 cents a horsepower on motor vehicles and a tax of 50 cents a gallon on all whiskey now held in Government warehouses.

Boston Worrying About Getting Cars for Show

Dealers Fear They Will Not Be Able to Get All Models They Wish for Exhibit

BOSTON, March 7—Boston motor car dealers are worried about their inability to get cars through from the factories to this city. With the show two weeks away and an avalanche of orders bound to come in from all New England, they are in a quandary. Some of them who will display nothing but regular models are trying all kinds of devices to get even stock cars for the show, as they fear with the opening so near at hand they may not have anything, and will be forced to borrow cars from owners.

They have been at Chicago, Cleveland, Detroit, Toledo, Buffalo and other cities who are hiring storage space; begging and bribing railroad men for any sort of freight cars; trying to jimmy cars into express shipments where there is a bit of room all to get models here. The last snow storm blocked 4000 freight cars at the neck of the bottle leading into New England from New York State for some weeks, and this has hampered them. Now they hear about higher freight rates. Some of them are figuring upon forming the New England Automobile Chamber of Commerce and getting enough dealers into it to be strong enough to demand things when the railroads leave government control. They say they can get shipments through Canada to Portland, and with good roads they can drive cars to New England cities. With Canadian railroads accepting shipments they could get some action in the competition that is bound to come later.

They are all hoping now that Boston will not have another blizzard.

ASBURY PARK TO HOLD SHOW

Asbury Park, N. Y., March 9—The fifth annual show under the auspices of the Monmouth County Automobile Dealers' Association is scheduled to open here March 13 and will continue for one week. This is the first time the show has been held in Asbury Park and the dealers here are making big preparations to make the event a success.

Louisville Show Opens Spring Sales Campaign

Exhibit is Held to Be One of the Most Successful Ever Promoted in the South

LOUISVILLE, Ky., March 8—Exceeding all previous efforts in fineness of exhibits, splendor of decorations and general grandeur, Louisville's twelfth annual automotive show, staged by the Dealers' Association, opened at Jefferson County armory Monday night to a record gathering of motor lovers. Holding attention until Saturday night it will be the most comprehensive exhibit of motor vehicles and accessories ever collected south of the Ohio river. Attendance records of previous years are being broken.

The Louisville show was the opening broadside fired by the combined automobile companies in the yearly sales campaign. It is the start of a new season's business.

In former years the main floor provided plenty of space for all exhibitors, but not so with the 1920 show. Only passenger cars and trucks are found downstairs, while the forty-five accessory booths crowd the immense balcony to overflowing. The eighty-seven exhibitors are showing forty-eight makes of cars, ten different types of trucks and hundreds of accessories that aim at economy, ease of operation and comfort. Many closed car models are being displayed.

The manner in which the Armory is decorated sets off all exhibits to the best advantage, with the color scheme on the main floor mahogany and white, and in the balcony green and white. Ten posts built after the fashion of the colonial period rise 50 ft. to meet streamers of evergreen, to each of which is attached myriad strands of electric lights. From the converging point is suspended an evergreen umbrella electrically lighted.

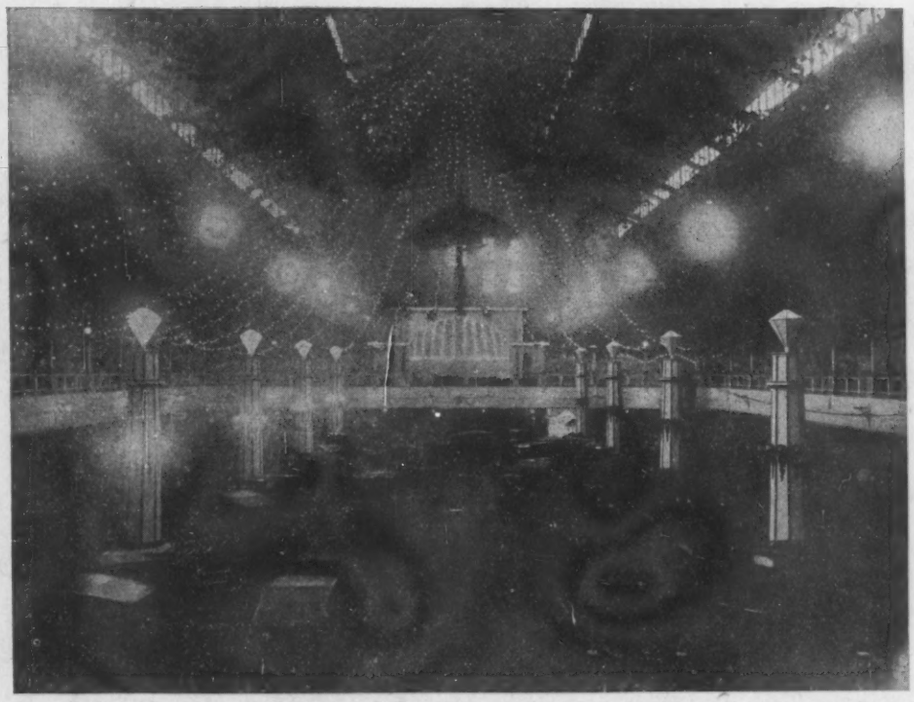
In the balcony at the rear of the Armory is located an especially constructed stand in which an orchestra of twenty pieces gives concerts each evening at 7:30 o'clock.

Conditions are no better now than they were last year. Indeed, dealers state that the demand for cars is heavier at present than it ever has been before. While immediate deliveries cannot be made, the dealers believe the situation is a healthy one for them, as it has been pointed out it will give them an opportunity to build up a steady demand for motor cars throughout the year.

From the dealers' point of view the 1920 show promises to be a marked success. It is this event which promotes closest co-operation between the distributors and their out-of-town dealers, and a greater number of these men are present than ever before. At their different conventions, dealers, distributors and factory men are discussing the same subjects, the future one of which is the immediate future of the automobile industry in Louisville and in territory supplied by local distributors.

Factory representatives in most instances give their viewpoint, asserting that automobiles are being placed on the market as rapidly as possible, and urge the dealers to drive their cars overland. Dealers, urged on by a motor-loving populace, call on the factories for speed and more speed.

A View of the Louisville Show



Louisville has an exceptionally tasteful and successful exhibit this year, staged by the dealer's association there

BLOOMINGTON SHOW A SUCCESS

Bloomington, Ill., March 7—The annual show of the Bloomington, Ill., Automobile Dealers' association, held at the John Deere building, Feb. 25 to 28, was marked by great success, attendance records being broken. The show was fortunate in the weather, the roads being in excellent condition, enabling farmers to reach the city. A feature of this year's show was the number of prospects.

All Is in Readiness for Indianapolis Exhibit

Big Hoosier Show This Week Finds Power Farming Equipment a Big Feature of Displays

INDIANAPOLIS, March 7—The Indianapolis Automobile show, which opens to-morrow at the Manufacturers' building, will be the biggest automotive show ever staged by the Indianapolis Trade association in point of number of exhibits and the demand for exhibit space.

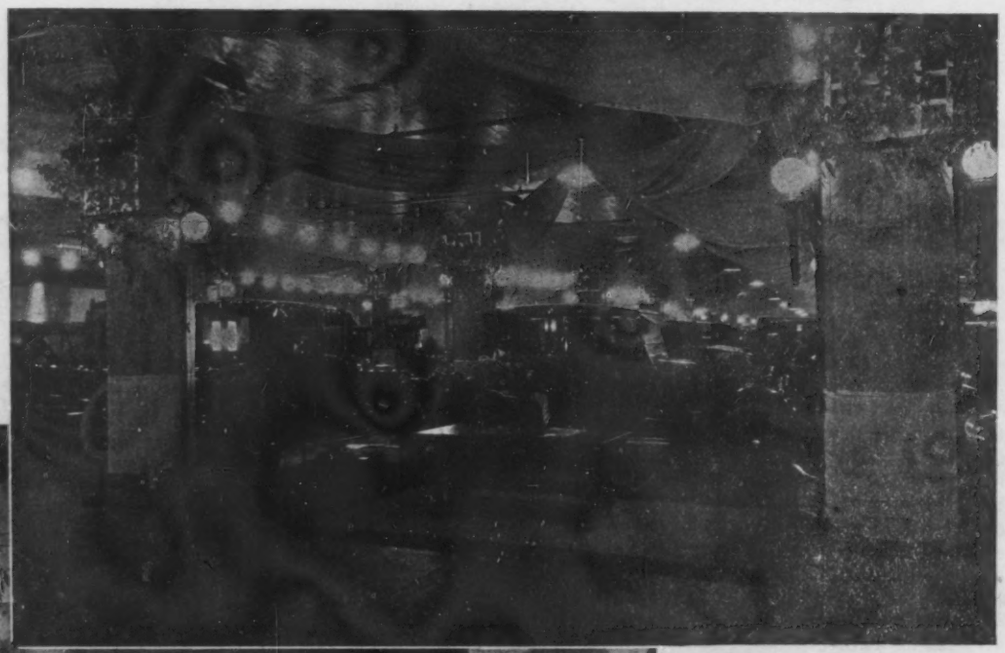
The Indianapolis show is an Indiana institution, staged by distributors who are directing dealers all over the state and who are interested in the correct merchandising to the Indiana buying power. The show will consist of automobiles, motor trucks, tractors, and one exhibit of the Curtiss airplane by the Curtiss Indiana Co. of Kokomo, Ind. The Indianapolis show will be featured by some lovely decorations, some good music and some features which are intended to assist the exhibits to pull buyers and dealers from every corner of the state.

The Indianapolis show will have the big features which were evident at the New York and Chicago shows, about all the new cars and, of course, the two Indianapolis new ones, the Lafayette and the H. C. S. and the other Indianapolis exhibit, the tearing down and the building up of Marmon engine, which Indianapolis and Indiana people are eager to see. Power farming is taking a big place in Indiana agriculture and the dealers are more and more getting interested in the tractor and farm power equipment and the rendering of the right service on those articles. Indiana, too, is doing much in the propaganda for the motor truck and its service to men, this propaganda being carried on by others, for the most part, than those financially interested in the sale of motor trucks.

The Indianapolis Auto Trade association is making efforts to get all dealers in the state to attend the show. An extensive advertising campaign has been carried on throughout the state for this purpose, weekly letters having been sent to newspapers of the smaller towns.

Views of Annual Detroit Automobile Show

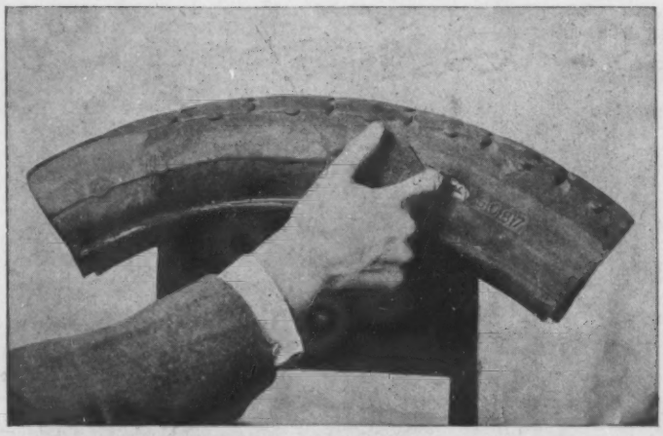
Detroit recently completed one of the most successful and attractive shows in its history. Always famous for its originality in displays, the City of the Straits fully justified its reputation this year. The exhibit was one of the most complete of the 1920 show season and the decorations were extremely tasteful throughout

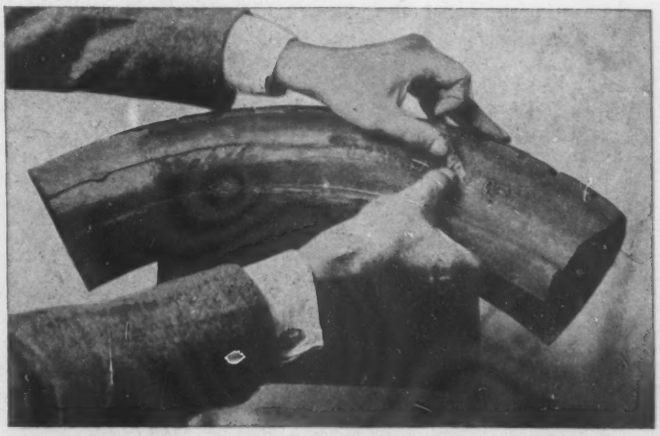


Above is a view of the show from the entrance; at the left is a corner of the accessory displays and below are two views of the car exhibits

Repairing a Blowout Correctly

A Frequent Mistake Made is the Addition of New Fabric Without Removing Worn Fabric from Injured Part of Tire





Upper left. Shows where the tire blew out 15 in. from the old blowout. The vulcanized section of the tire can be seen to the left. The added layers caused the tire to bend the weave back and forth at every turn of the wheel which caused the fabric to separate from the rubber as shown at the right. The picture to the left below shows the approved method of stripping back the carcass before adding new layers of material. The right hand picture shows the wrong method of adding the layers. The re-inforcement should be tapered off gradually so that there will be no hard unyielding section at the junction of the repaired part. In one case eight plies of fabric were added and in running a "hinge" was formed at the merging point of the five and thirteen-ply sections. The "hinge" constantly worked back and forth thereby over-working and weakening the fabric, the result being a blow-out at this point. The eight added plies has formed a stiff unyielding section that refused to work in harmony with the rest of the tire

CAN a worn or injured tire be successfully repaired? To this vital question experts of the B. F. Goodrich Rubber Co.'s tire repair school answer "Yes." But if you asked these same experts whether the average tire is always efficiently and successfully repaired, the answer is immediately reversed.

Careless and unscientific repairing is responsible for the loss of hundreds of thousands of dollars to American car owners each year. And to this should be added the loss incurred by neglected repairs—tires thrown away whose life could have been prolonged.

Remove Old Fabric

What is the most frequent mistake made by repair men and how avoided? The reply is: Failure to remove worn fabric from injured portion of the tire and the practice of adding rather than replacing layers of fabric.

The illustrations shown herewith tell the story. Here are shown three views of a four-inch, five-ply fabric tire which was repaired by adding eight plies of new fabric to the tire's five plies of worn fabric. After running a few hundred miles the tire blew out. The motorist went to the repair-man who said: "Why the blowout occurred 15 in. from the repaired part. The tire originally was defective."

Manufacturer Blamed

The car owner then laid the blame on the manufacturer. The truth is the repairman and not the tire was at fault. This is what actually took place. The eight plies of extra fabric was found, upon examination, to extend to the point of the blow-out. In running a "hinge" was formed at the merging point of the five and thirteen-ply sections. The "hinge" constantly worked back and forth, thereby over-working and weakening the fabric. A blow-out resulted. The eight added plies had formed a stiff unresisting section that refused to work in harmony with the rest of the tire.

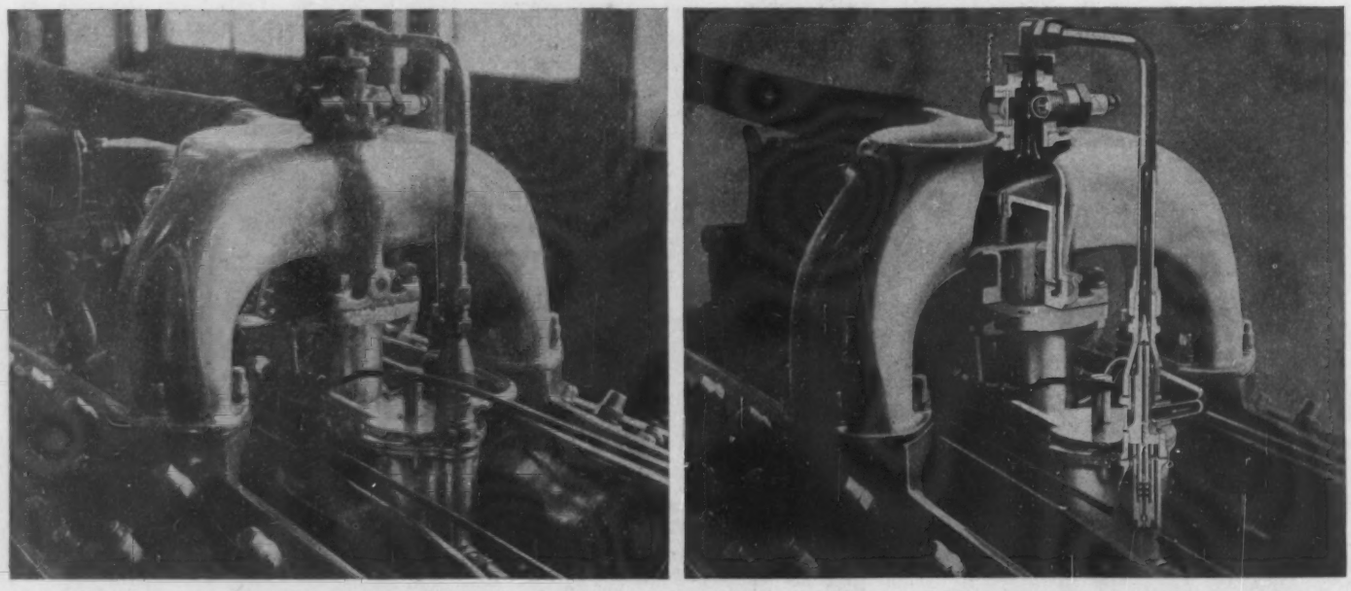
The illustration shows a tire stripped back in the approved factory method of repair. All except enough fabric for a foundation has been removed. The fabric is removed by steps, thereby avoiding a sharp break between the old and the new fabric. New fabric is not added to the old, worthless fabric. Then the repair man should begin the process of building up, using the best materials obtainable, including high grade cements, sheets of raw rubber and new rubber impregnated with cotton fabric.

Avoid Overcuring

Then after the carcass is built up to the proper thickness, the tire should be vulcanized. When placing the tire in the mold, extreme care should be taken that overheating does not result. The sections at each junction of the recure should be carefully fitted to the mold so that there will be no overcured section between the joints of the successive cures. If these sections are overcured a sponge effect is produced.

Fuelizer to Overcome Low Grade Fuel Difficulties

New Device Brought Out By Packard Provides Complete Combustion Has Greatest Efficiency When Engine is Cold



Two views of the Fuelizer installed on Packard engine on which it is standard equipment. At the right is a cut-away view showing operation. According to tests an engine equipped with this new device is ready for high gear work within twenty seconds after cranking, regardless of the temperature

THE woes that beset engines have been gradually increasing as the quality of the fuel on which they were required to run has decreased. Under average running conditions, kerosene splatters about in the cylinders. It removes the film of protecting oil from the walls; some of it collects and burns, turning to carbon that fouls the engine,and the remainder runs down past the pistons and dilutes the lubricating oil in the crankcase.

Engineers have agreed that this condition could be remedied only by providing for complete combustion of the fuel in the cylinders, and the Packard experimental laboratories have brought forth a new device called the Fuelizer to adapt Packard engines to the fuels obtainable today—and tomorrow. According to Col. J. G. Vincent, vice-president of engineering of the company, the Fuelizer not only assures a clean engine, but it also eliminates all trouble in connection with starting the engine in cold weather. Tests show that an engine equipped with the new device is ready for high gear work on a summer setting of the carbureter within twenty seconds after cranking, regardless of the temperature.

During the past few years automobile manufacturers have spent much time and money trying to meet the threat of decreased quality of gasoline, due to the great expansion of the industry and the consequent drain on the oil reserves of the country. The experiments centered about the idea of heating the charge as it passed into the engine, and the most common device was the exhaust heated intake. This system provided the engine with no heat when it was starting, slight heat when it was idling, and a maximum of heat when the engine least needed it. A complete reversal of this process was the aim of L. M. Woolson, the engineer who developed the Fuelizer.

The Fuelizer, as it has been perfected to bcome a standard part of the Packard motor cars, gives the maximum heat to the charge when the engine is starting and idling, and drops out of operation when the engine is able to supply its own heat. It gives complete combustion of the fuel in the cylinders, and during the months of test there was not a single instance of engine fouling.

Action Is Entirely Automatic

The Fuelizer consists of a small supplementary carbureter and a burning chamber where the gas from the little carbureter is burned. This chamber is situated in the intake manifold. When the gas enters, it is ignited by a regulation spark plug, and passes into the fresh charge going from the carbureter to the cylinders. The heat of the burnt gas changes the wet, poorly carbureted mixture to a dry vapor, which explodes with full efficiency when it is touched off by the spark in the cylinder.

The action of the Fuelizer is entirely automatic, without involving a single moving part. When the engine is starting the Fuelizer is in full operation, and the heat supplied to the charge becomes less as the throttle is opened. This regulation is provided by an air-valve similar in operation to the air-valve of the main carbureter.

Through a small Pyrex glass window the operation of the Fuelizer may be seen. A perfect mixture produces a purple flame, a fairly rich mixture produces a bluish-green flame, and an exceedingly rich mixture is indicated by yellow streaks in the flame.

PEERLESS INCREASES PRICES

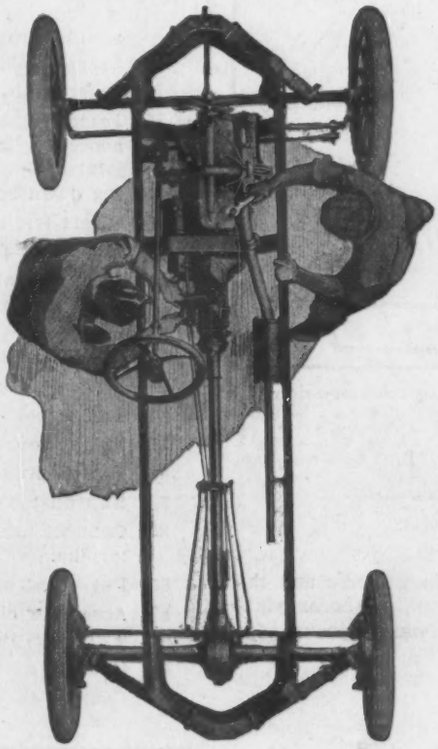
New York, March 8—Announcement is made by the Peerless Motor Car Co., Cleveland, of increases in price of $150 on open models and $200 inclosed cars. The increases are as follows: Seven-passenger touring car, from $2900 to $3050; four-passenger roadster, from $2900 to $3050; four-passenger coupe, from $3500 to $3700; seven-passenger sedan, from $3700 to $3900.

KRASBERG ENGINEERING BUILDS

Chicago, March 7—The Krasberg Engineering & Mfg. Corp., manufacturers of piston rings, universal joints and other automotive equipment, have made extensive additions to their plant. A new structure has recently been completed with seven stories and basement, 200 ft. long and contains 130,000 sq. ft. of additional floor space. The company is now engaged on several production jobs for large automobile manufacturers.

SERVICING THE OVERLAND FOUR

THIS is the fourth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefit of this series.



PART IV—The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE REAR CAM BEARING OR FLYWHEEL

Time: 3 hrs, 30 min. If cam bearing is installed, 3 hrs, 45 min.

1. Remove hood.
2. Drain radiator.
3. Remove front splasher by removing one 5/16-in., two 3/8-in. cap screws, and two 1/4-in. stove bolts.
4. Disconnect battery cable at battery. Disconnect wires from lamp sockets, pull wires through shroud and radiator shell.
5. Remove radiator shell.
6. Remove 5/16-in. nut on radiator stay rod and pull rod out of radiator bracket.
7. Remove 5/16-in. bolts, with nuts and lock washers from starting crankshaft bracket.
8. Remove two 3/8-in. radiator holding down bolts with flat steel washers.
9. Remove one 5/16-in. cap screw with lock washer from lamp stay-rod.
10. Loosen radiator hose clamps.
11. Remove radiator.
12. Remove clamp bolts and remove clutch and brake pedal pads.
13. Disconnect speedometer cable at speedometer head.
14. Unscrew accelerator button and disconnect spring.
15. Remove floor boards.
16. Disconnect brakerod from brake foot pedal by removing cotter and clevis pins.
17. Loosen clamp bolt clutch pedal to clutch operating shaft and remove clutch pedal.
18. Remove brake pedal.
19. Disconnect hand brakerod from hand brake lever by removing wing nut from rod.
20. Remove four 5/8-in. nuts holding transmission cover assembly to transmission.
21. Remove transmission cover assembly.
22. Remove spark control from distributer.
23. Remove gasoline throttle control wire from carbureter.
24. Remove carbureter choke wire from carbureter.
25. Remove gasoline tank to carbureter gasoline line.
26. Remove starting motor cable from starting motor.
27. Remove two clamp bolts from coupling connecting steering column to steering gear lower unit.
28. Disconnect horn wire.
29. Pull steering gear column up out of the way.
30. Remove two cap screws holding muffler pipe to exhaust manifold.
31. Disconnect wires from ignition coil.
32. Loosen two clamp screws and remove ignition coil.
33. Disconnect primary ignition wire from distributer.
34. Remove nuts and lock washers from engine holding down bolts.
35. Drive engine holding down bolts out of frame hangers.
36. Remove generator wire.
37. Put chain sling around engine, as shown in Fig. 9.
38. With crane or chain falls, carefully remove engine from frame. Place engine on suitable bench or in engine stand.
39. Unscrew cap screws holding starting motor to engine base.
40. Withdraw starting motor until hand can be inserted to reach starting motor pinion.
41. Rotate pinion until counter weight is on top.
42. Remove starting motor as in Fig. 7.
43. Drain oil from engine through plug in bottom of oil base.
44. Drain oil from transmission through plug in bottom of transmission case.
45. Unscrew all cap screws holding transmission case to engine base.
46. Remove transmission.
47. Remove sixteen cap screws holding oil base to engine base.
48. Release clutch by placing two hardwood blocks, 1½ in. thick, 4 in. long, between clutch thrust bearing and clutch plate.
49. Remove eight 5/16-in. cap screws from clutch coverplate.
50. Remove clutch coverplate.

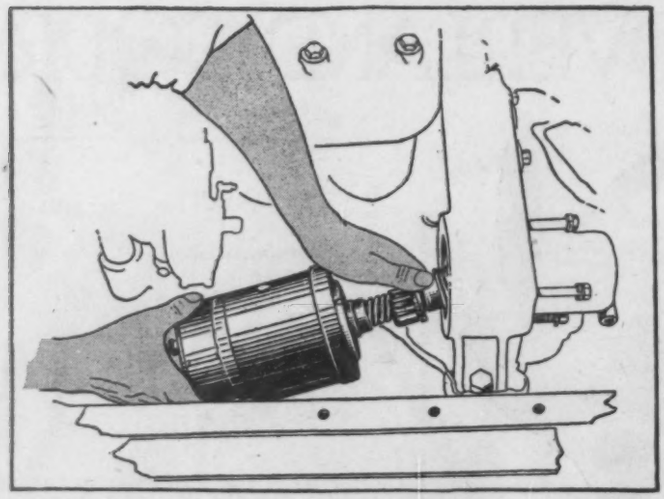


Fig. 7—Removing starting motor, showing counterweight at top

51. Remove clutch driving discs.
52. Remove two pressure plate dowel pins.
53. Remove cotterpins from flywheel bolts.
54. Remove flywheel bolt nuts.
55. Remove flywheel. See that crankshaft flange and the receptacle countersunk in flywheel to accomodate crankshaft flange are thoroughly clean to insure flywheel fitting properly.
    If rear camshaft bearing is to be installed, the following operations are necessary:
    Remove dowel screw at side of engine base holding rear bearing in position.
    With drift-punch and from underneath engine, drive out rear cambearing. Install new bearing, locking into position with dowel screw. When installing bearing, care should be taken to see that hole in bearing lines properly with the dowel screw hole in engine case and that oil groove in bearing is at the bottom.
56. Assemble flywheel to crankshaft, making sure that flywheel bolt holes register with each other.
57. With four bolts, bolt flywheel securely to crankshaft flange.
58. Cotterpin.
59. Put in clutch shaft annular bearing.
60. Put in one molded asbestos disc.
61. Put in driven disc.
62. Put in molded asbestos disc and assemble clutch dowel pins in flywheel.
63. Assemble clutch pressure plate on dowels.
64. Put on clutch cover, fastening with eight cap screws. All holes of clutch cover must line up with holes in flywheel, leaving blocks in place until cover is securely fastened to flywheel.
65. Remove blocks from between clutch thrust bearing and clutch cover.
66. Put on oil base, fastening with sixteen $\frac{1}{4}$-in. cap screws. The hub of the driven disc in the clutch must be centrally lined so that clutch shaft will enter splines of driven disc.
67. Replace transmission, pushing clutch shaft through as far as possible.
68. Place key in clutch operating shaft and put on clutch pedal, prying forward, which will pull the transmission into place.
69. Bolt transmission securely to engine base.
70. Install starting motor, making sure that the counterbalanced weight is at the top, so that it will not interfere with flywheel when installation of starting motor is made.
71. Bolt starting motor securely to engine base.
72. Put chain sling around engine and with crane or chain falls, lower engine into frame—one man is needed at rear end of engine to steer torsion tube into universal joint housing. It may be necessary to pry engine into position by using piece of scantling or long board against front end of engine case and front axle.
73. Line up engine frame hangers with short pinch bar.
74. Insert right front engine holding down bolt.
75. Insert right rear engine holding down bolt. It may be necessary to use jack between frame sill and universal joint housing in order to insert right rear engine holding down bolt.
76. Insert left rear engine holding down bolt.
77. Insert left front engine holding down bolt.
78. Two men are needed to put on side and front engine shields, engine holding down bolt lock washers and nuts. Fasten securely.
79. Place transmission sliding gear in neutral.
80. Place gear-shift lever in neutral.
81. Put on gear-shift housing.
82. Put on four lock washers on gear-shift housing studs.
83. Put on stud nuts and tighten.
84. Slip on brake pedal over clutch fork shaft .
85. Connect brake rod to brake pedal with clevis and cotterpins.
86. Put Woodruff key in clutch fork shaft.
87. Assemble clutch pedal and shaft and clamp securely with clamp bolt and nut.
88. Connect carbureter choke wire to carbureter.
89. Connect throttle wire to carbureter.

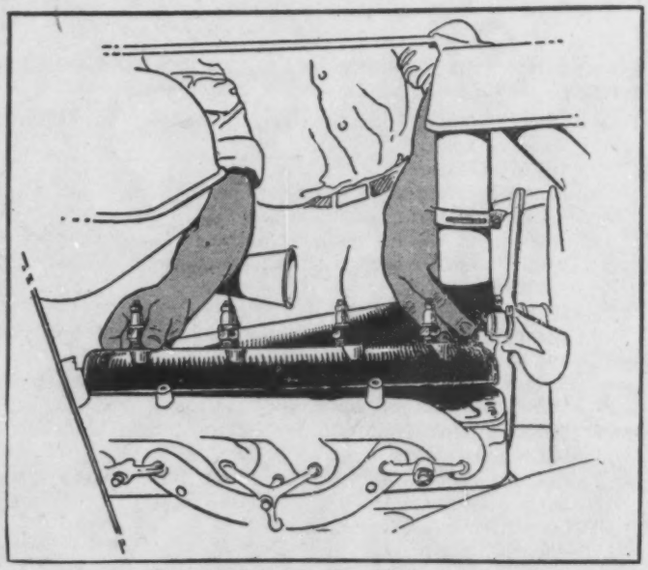


Fig. 8—Lifting off cylinder head

90. Connect starting motor wire.
91. Put on gasoline tank to carbureter gasoline line.
92. Connect muffler tube to exhaust manifold with two cap screws, lock washers and nuts. Care must be taken to see that gasket is between exhaust manifold and muffler tube flange.
93. Put on clamp ignition coil in place.
94. Connect ignition wires to coil.
95. Connect primary ignition wire to distributer.
96. Connect spark control wire to distributer.
97. Check timing of engine. Remove No. 1 spark plug, then remove distributer cover. Crank engine until No. 1 cylinder is on compression stroke—this can be determined by holding hand over spark plug hole. Insert

wire in spark plug hole and crank engine slowly by hand until piston reaches highest point of travel. Continue cranking slowly until top of piston is flush with cylinder block. The piston in this position corresponds with point of firing mark on flywheel, with spark control button in fully retarded position. The breaker just coming in contact with No. 1 plug contact post in distributer cover, at this position of piston. If timing is off, release clamp screw holding distributer to generator and set timing by remeshing distributer driving gears.

98. Put on fan belt.
99. Put on radiator with two ⅜-in. cap screws, lock washers and nuts and tighten securely.
100. Connect radiator hose and clamp tightly.
101. Put on starting crankshaft and bracket assembly. Bolt to radiator with two ⅜-in. bolts, lock washers and nuts.
102. String front lamp wires through holes in fan shroud on radiator.
103. Put on radiator shell, lacing headlight wire through holes in radiator shell.
104. Slip front splasher under radiator shell and line up holes on shell and splasher. Fasten assembly to frame with one ⅜-in. cap screw, two ⅜-in. cap screws, and two ¼-in. stove bolts and nuts, using flat washers under cap screw heads.

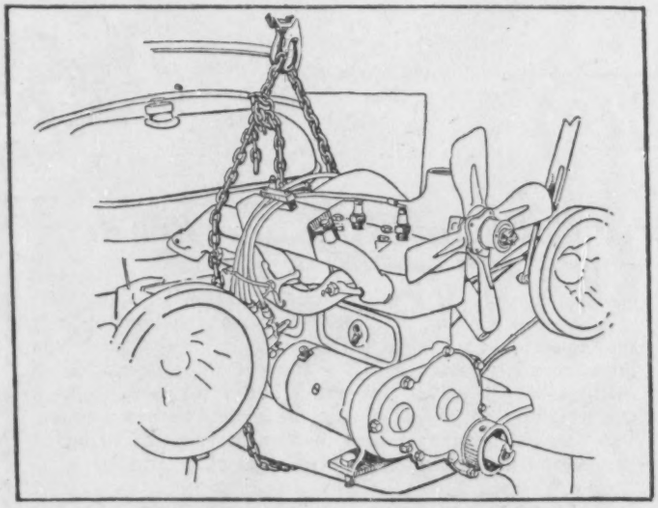


Fig. 9—Showing how chain should be slung around engine for removal

105. Put on front lamp stay-bar.
106. Connect front lamp wire to lamp sockets and connect lamps; also replace battery cable.
107. Put on radiator stay-rod.
108. Fill radiator with water.
109. Put one gallon of oil in engine base, through engine breather tube.
110. Connect speedometer cable.
111. Put in floor boards.
112. Put on pedal pads.
113. Connect accelerator spring and screw on accelerator button.
114. Connect speedometer cable to speedometer head.
115. Tune up engine.
116. Put on hood.

TO REMOVE AND REPLACE VALVE SPRING

Time: One valve—1 hr., 30 min. Complete set of valves and valve springs—3 hrs., 30 min.

1. Remove hood.
2. Drain radiator.
3. Remove distributer head.

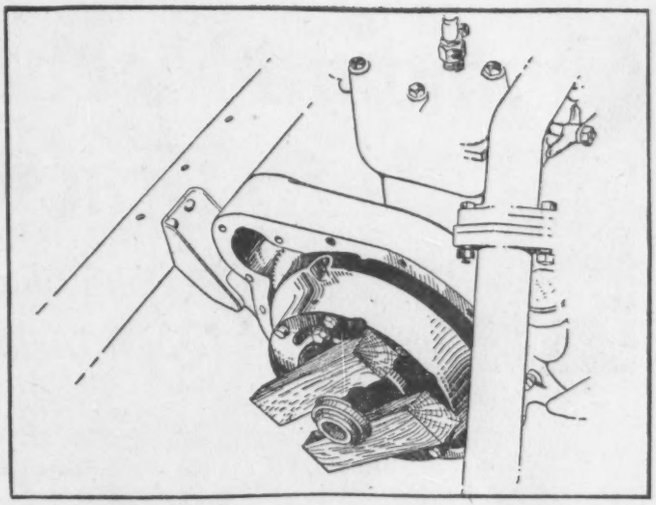


Fig. 10—Proper manner to block out clutch

4. Remove carbureter hot-air stove from exhause manifold by removing three ⅜-in. nuts.
5. Loosen hose clamps on upper radiator hose and slide hose well up on radiator inlet pipe.
6. Remove fourteen cylinder-head cap screws with special socket wrench.
7. Remove fan belt.
8. Remove cylinder-head and cylinder-head gasket.
9. Remove intake manifold. It is absolutely necessary when removing intake manifold not to remove the exhaust manifold.
   Front and rear yokes should be loosened and turned far enough to clear intake manifold. Then tighten to hold exhaust manifold in place so that the exhaust manifold gaskets are held in position, which will facilitate assembly.
10. Remove manifold yoke and take off intake manifold.
11. Remove valve cover.
12. With valve lifter, lift valve spring and remove valve spring pin.
13. Crank engine by hand until push rod is at its lowest point of travel.
14. Lift out valve and remove valve spring.
15. Reseat valve, using operations Nos. 11 to 25 in operations covering the grinding of valve.
16. When valve is properly seated, replace valve spring and spring cup.
17. Replace valve and with lifter install valve pin.
18. Loosen lock nut clamping push rod adjusting screw and turn adjusting screw so there is but .003 in. clearance between push rod and valve stem. Tighten lock nut securely.
19. Put on valve covers.
20. Install intake manifold, making sure that manifold gasket is in proper position.
21. Put on center manifold yoke .
22. Loosen end yokes. Place in position and tighten securely.
23. Clean surfaces of cylinder-block and cylinder-head.
24. See that both sides of cylinder gasket are clean and cover with coating of heavy cup grease.
25. Replace cylinder gasket in position.
26. Put on cylinder-head and tighten with four center cap screws; then tighten the remaining cap screws.
27. Connect radiator hose to cylinder-head with hose clamps.
28. Put on distributer head.
29. Put on carbureter hot-air stove with three ⅜-in. nuts.
30. Fill cooling system with water.
31. Put on hood.

Standard Mechanical Operations in Tractor Service

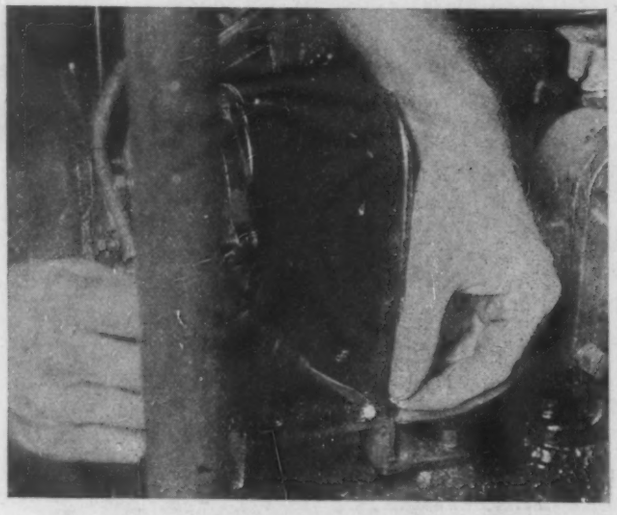
by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

EDITOR'S NOTE: The two pages herewith are the sixth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told how to locate a faulty cable which was the cause of the engine missing fire through cable being oil-soaked or abraded. This installment deals with the magneto. How to remove a collector brush and correct procedure for cleaning and replacing. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.

PART VI

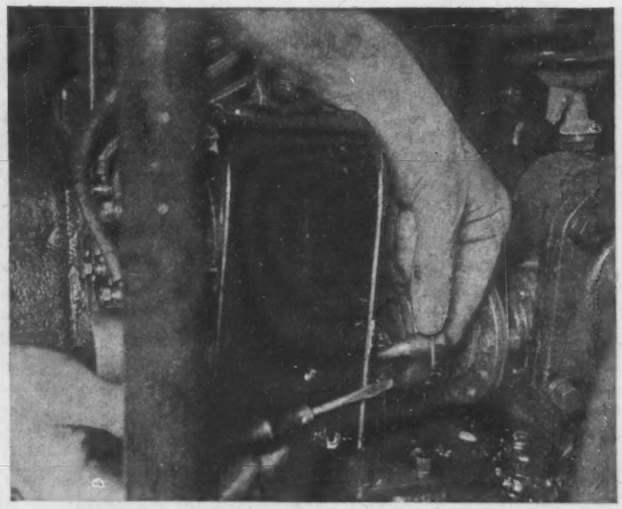
Ignition Troubles Caused by Dirty Collector Ring and Brush

It is necessary to provide a simple and accessible means to collect the primary ignition current generated in the magneto and to transmit it to the binding post or other connection on the high tension coil. For this purpose a collector ring is used on the armature shaft and adjacent to and in contact with it, what is known as the collector brush. For the proper operation of the engine the contact of the collector brush with the collector ring must be clean and even. In the course of operation oil, and small particles of dust or dirt filter through the housing and the collector ring becomes dirty or gummed and this introduces a resistance to the flow of the current to the collector brush. This resistance often becomes so high the sparking takes place and the brush becomes pitted. This condition thus results in the intermittent firing of the engine and often in its refusal to start at all.

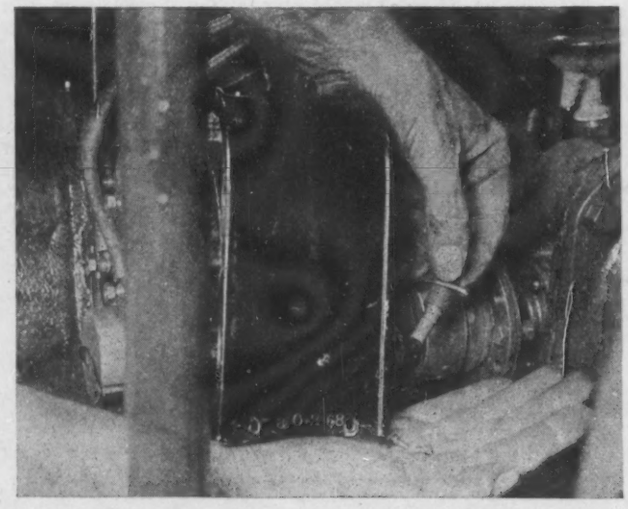


1. Cleaning dirty collector brush and ring. Loosen dust cover of magneto and free edge of brush holder. The dust cover is a most important constructive feature of tractor magnetos

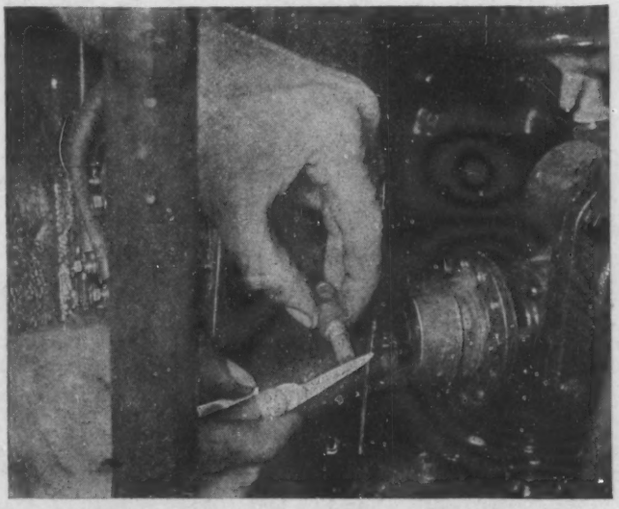
2. Remove collector brush by taking out screws. The screws are comparatively small and the threads quite fine. It is important that light tools and care be used in removing these fastenings



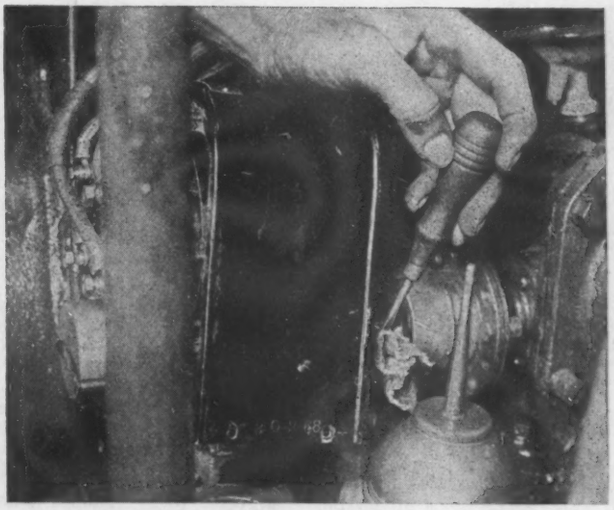
3. Remove collector brush from magneto, moving the hand in the direction of the length of the brush, until the end is free from the hole



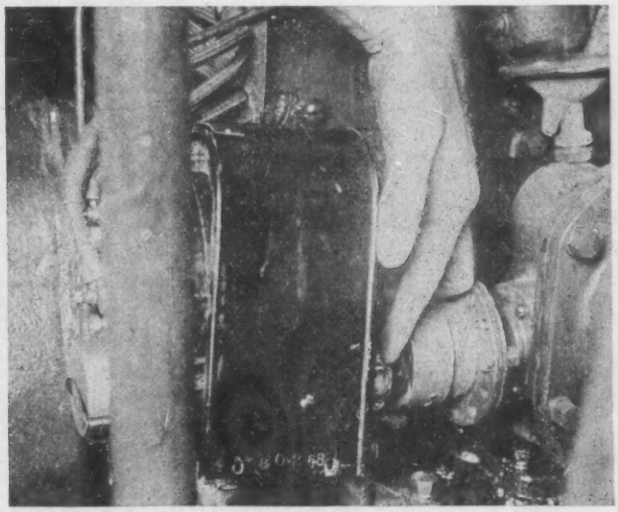
4. Collector brush removed with holder and spring. Tip or point of brush will be found covered with "gum" or badly pitted from sparking caused by resistance offered by dirt and oil, to the flow of the primary current



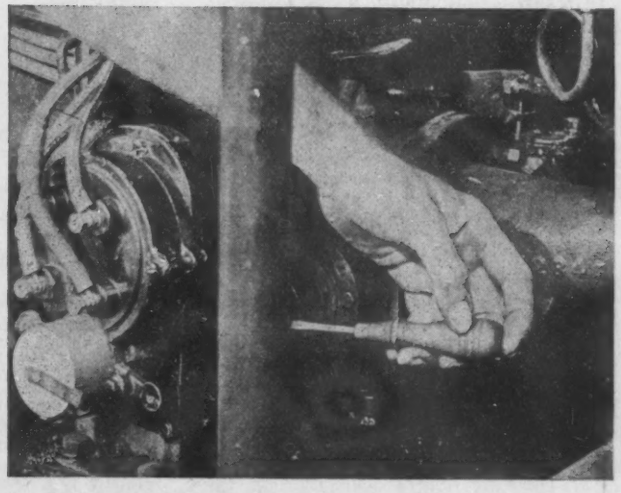
5. Scrape collector brush with knife to remove scale. If the tip of the brush it pitted, care is required to leave a smooth surface, after the repair is made



6. Insert cloth dampened with gasoline through the brush opening. To clean ring turn armature over several times, holding cloth in contact with ring



7. Inspect collector ring through the brush opening and if it still appears dirty repeat the operation outlined above



8. Carefully replace brush so that it sets square and the spring is in proper position to hold contact of brush on ring firmly

Garage Planning
Service Station Arrangements

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

No. 194

FORD SERVICE STATION

I am enclosing herewith a rough sketch of lot upon which I am going to build a garage to handle a Ford agency. The building is to be a concrete structure one story high. I wish to have in the rear of the building a repair department, and an office in or near the front, also a show window. Would it be advantageous to build the office as a balcony?

I will appreciate a plan from you giving your opinion as to the best arrangement. I realize that 40 by 140 is a little small, but I believe with proper arrangement it will be fairly satisfactory.—E. L. Martin, Washington, D. C.

You are right about 40 ft. being too narrow; however, you are saved by the fact that you handle Fords. They can be handled as well or better in a 40 ft. space than 16 or 17 ft. cars can in a 50 ft. space.

A balcony office is perfectly good practice and is used in thousands of garages. Its principal advantage is a space saver. We note that you suggest the rear entrance position at the side directly in the rear of the front entrance. This arrangement allows placing of cars only on one side, limiting the capacity for cars, whether undergoing repairs or in storage.

If, as we believe, you contemplate Ford service rather than general garaging of cars, the plan we show with a center entrance to the shop would be the best layout; the rear entrance should not be used as a general thoroughfare, however, as that would make unnecessary havoc in the shop.

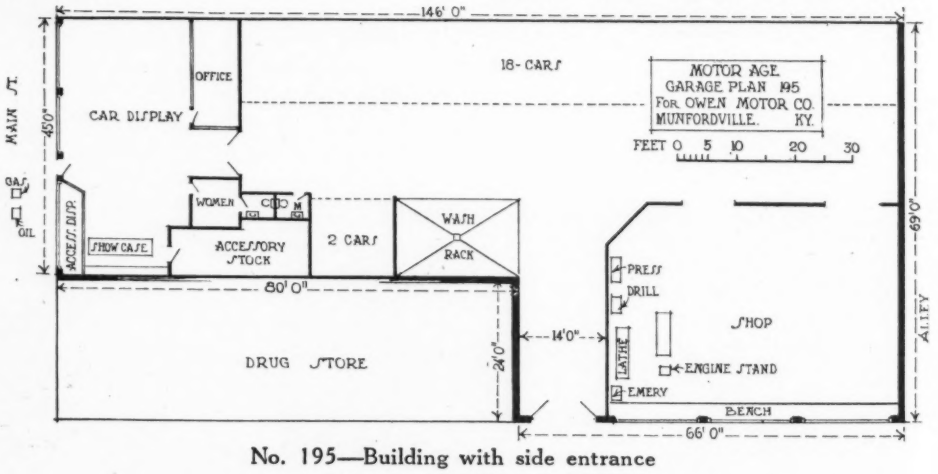
No. 195

BUILDING WITH SIDE ENTRANCE

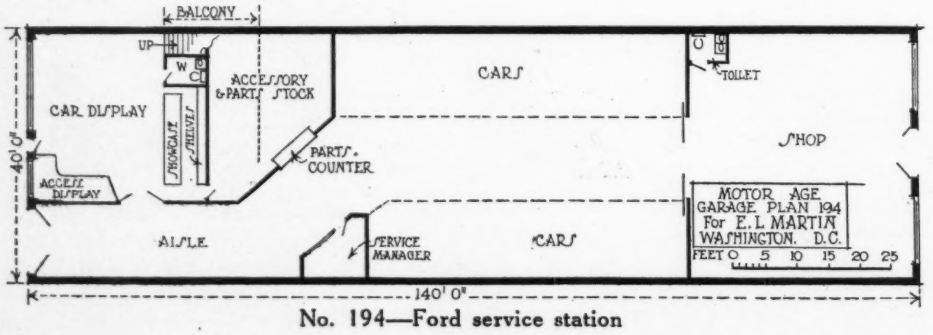
We are planning the erection of a garage and service station and have as a site, a lot located on Main street, which is also Dixie highway, and in this connection beg to submit to you herewith a pencil sketch showing size, location, etc., of said lot.

We would like show room on Main street which would accommodate two small cars, an office, two toilets and stock room of medium size. Locate in the most convenient place a shop to accommodate about three mechanics with the usual power-driven tools, also locate a gasoline filling-station, oils and wash-rack. We would also like an entrance to both garage and shop from the side-street.

The writer has been a regular subscriber to Motor Age for more than a year, and thinks beyond a doubt that you have the completest and best magazine of its kind published.—Owen Motor Co., Munfordsville, Ky.



No. 195—Building with side entrance



No. 194—Ford service station

On account of the narrowness of your building, on Main street, it would be a waste of valuable space to have an entrance on that side. It not only would take a 10-ft. strip off the showroom but displace two or three cars in the garage.

We have allowed more space in the showroom than would actually be needed to display two cars. It could be cut down by pushing the whole layout forward 6 or 7 ft., thus gaining space for another car on each side of the garage.

In like manner, if the shop, which is 36x50 ft., seems larger than you think advisable, move the forward partition back about 15 ft., leaving space for five or six cars facing the aisle. It might be well to start with the smaller shop, and if your business runs to repairs rather than storage, you could extend it across the rear of the building, almost doubling its size, without moving any machinery and at the expense of only five storage spaces.

No. 196

TIRE REPAIR DEPARTMENT

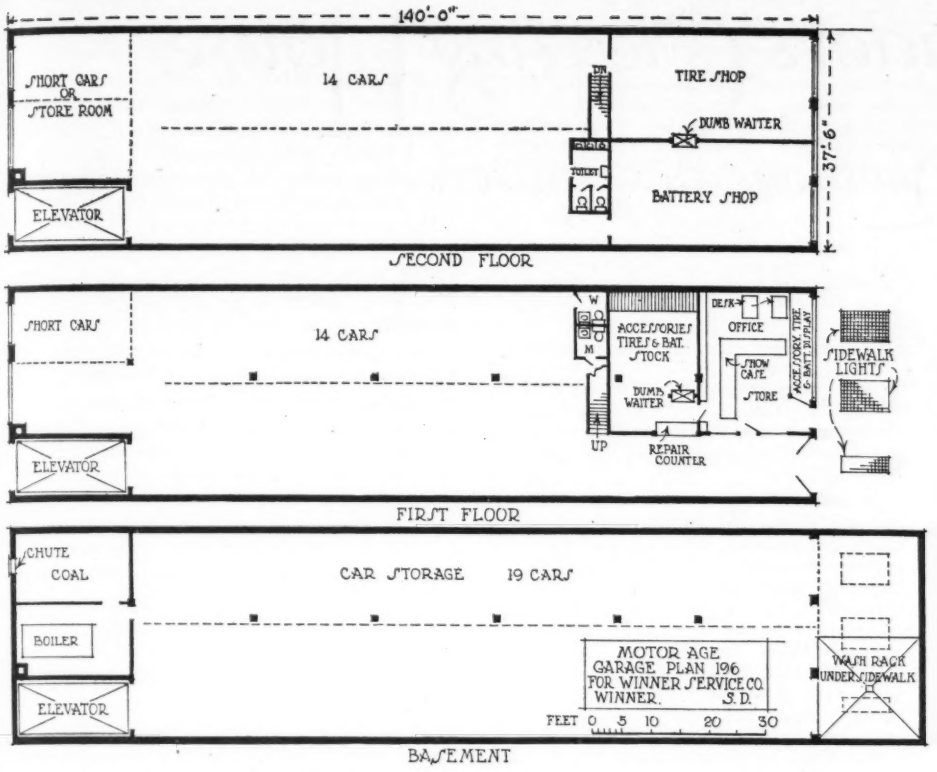
I am trying to buy one-half of the lot next to me of 12½ ft. I will then have 27½ ft. frontage by 140 ft. deep. I want to have two stories and full basement.

This building is to be used for car storage tire and battery repair shops and salesroom for tires, batteries and accessories with an office also.

That battery repair-shop in the Motor Age sure is a dandy, and when I get my new building it will go in to the last detail. If in some former issue of the Motor Age you had a tire repair shop laid out I wish you would send it to me.

My lot is an inside one, the north line fifty ft. from the street, facing west.—Winner Service Co., Winner, S. D.

You had better do your best to obtain the extra 12½ ft. of land as that will make a reasonably good-sized space so that large cars can be stored in one row



No. 196—Two-story building and basement

with a good aisle, while short cars like Fords may be doubled up in two rows and still have aisle space.

The tire and battery shops are on the second floor with a dumb waiter so placed that it will serve both shops. We have never run any special tire shop story similar to the battery shop you mention, though there have been several tire shops shown in the Garage Planning Department.

The repair counter might be in the store, but old batteries and tires are such dirty things to handle that it would be better to keep them out of the office and store altogether, though with the layout shown the same people can handle them who tend the accessory store.

We have placed the wash-rack in the basement under the sidewalk where it can be well lighted from above through sidewalk lights.

Tractor Service in Southwest Needs Stimulation

(*Continued from page 17*)

horse-drawn line and the necessity of maintaining a policy of connection with the dealer, I would throw the whole kaboodle of dealers over, and sell every one of our machines direct from this office."

The foregoing fairly represents the estimation in which the tractor dealer of whatsoever denomination is held by the men responsible for putting tractors into the Southwest. It is manifestly necessary that something be done toward raising the standard of the dealers, impressing upon their minds the fact that they have assumed definite responsibilities in presuming to be a part of the distributive organization in modern tractor merchandising, and to convince them that they must do more efficient work. As was said at the very outset, if they do not do this, a better and more efficient dealer will be developed to displace them. Already this is coming to pass. Not a word has been said in this article about the exclusive power farm equipment dealer. Yet, he is a tremendously active and important factor in the development of the tractor business of the Southwest, and already some of the organizations are composed of such dealers to nearly 25 per cent of their number. Furthermore, these dealers appear to realize the importance and responsibilities of the work they have undertaken, they are equipping for service, they are hiring competent mechanics, they are employing able salesmen, and they are selling tractors in large volume, and making money. It would be possible to quote a number of branch house managers as unqualifiedly indorsing the power farm equipment dealer who handles such products exclusively as the coming dealer in the tractor trade, and they frankly admit that if he continues to increase in number and keeps up his present standard of efficiency he will put every other old line dealer definitely and finally out of the tractor business.

NEW WILLYS-KNIGHT PRICES

Price changes on the Willys-Knight which were received too late to publish in the show issue of MOTOR AGE, make the present list of the Willys-Knight line as follows: Touring car and roadster $1975, coupe and sedan $2950. The coupe is a three-passenger model, the sedan and touring car are both five-passenger, and the roadster is three passenger. They have a number of changes in the chassis of these models. The frame is entirely different and there are a few changes in the engine.

ROAMER USES CONTINENTAL ENGINES

Regarding the specifications of the Roamer car which were incorrectly published in a recent issue of MOTOR AGE, we wish to correct the impressions given. The Continental engine is used in all Roamer models, except on special order, when the Dusenberg racing type engine is fitted. The Roamer chassis has a 128 in. wheelbase. The Bijur starting and lighting system is used together with Bosch magneto for ignition. The carbureter is the Stromberg of 1¼ in. size.

GOVERNMENT BUYING TRUCKS?

Washington, March 8—A resolution was introduced into Congress to-day, asking the War Department if it had purchased any "militaire" trucks or other trucks this year. This resolution was introduced as a result of debate on the floor of the house about a bill authorizing the War Department to transfer surplus motor vehicles to the Department of Agriculture for road building purposes. It was stated that seventy-five trucks, some of them valued as high as $8,000, were purchased by the War Department this year. As a result of this statement and the declaration that a surplus of trucks exists, the resolution was introduced.

BACON MOTORS TO EXPAND

Philadelphia, March 7—H. L. Archey, formerly of this city, now sales manager of the Bacon Motors Corporation, has announced that two additional automobile factory buildings and a large office building will be erected by the corporation on its 21-acre tract adjoining the Butler Avenue & Allegheny Western Railroad tracks, in New Castle, Pa. One factory building, recently completed, has begun manufacturing operations.

The additional structures will be a large shop for the making of automobile motors; a three-story building, 600 ft. by 50, for a body-building, upholstering and painting plant, and the office building, which will provide facilities for the officers of the corporation and the superintendents of the various departments. There will be a cafeteria for employees in the basement.

REMAKE AJAX WESTERN PLANT

Racine, Wis., March 8—The Ajax Rubber Co.'s western works, known as the Racine Rubber Co., of Racine, Wis., were closed down during the week of March 1 to 6 to facilitate the final installation of new equipment and power plant machinery costing $200,000, which has been going on for several months. The daily production is being increased from 3300 to 4000 tires.

The Readers' Clearing House
Questions and Answers

Conducted by Roy E. Berg
Technical Editor—Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

OXYGEN METHOD OF REMOVING CARBON

Q—Explain so-called Oxygen method of removing carbon.

2—Explain the method of lapping pistons.

3—When oversize pistons fit too tightly will lapping them make them all right?

4—Will the installation of counterbalances and balancing of crankshaft, pistons and rods in the Ford engine reduce vibration enough to make it worth the trouble?—H. L. Stahlman, Newman, Calif.

1—It is suggested that the day before operations are to begin the engine be given the conventional kerosene treatment. A half-tumblerful of kerosene is poured into each cylinder and permitted to remain there over night.

As a precaution against fire the gasoline is shut off from the carbureter and the engine started so that the fuel in the line will be consumed. Work is done on one cylinder at a time. Taking the first cylinder, a cylinder plug is removed. The engine is then turned over until the piston of that cylinder is on top dead center. If the spark plugs are not removed the points will become burned so, as a precaution, insert old spark plugs.

The outfits on the present market are fitted with gages and this gage should be made to register about 12 lb. The hose attached to the tank has at its end an injector tube. This tube is directed into the cylinder as shown in Fig. 1. The injector is controlled by a valve, in one case a trigger valve, so as to be manipulated easily. A lighted match is dropped into the cylinder and the injector tube inserted into the cylinder and moved around as much as possible so as to cover a large area. The combustion of the carbon is accompanied by sparks and perhaps a little flame from any oil with which it may be soaked. Once the carbon begins to burn the action continues without interruption as long as oxygen is being supplied. The difficulty with many has been in getting the initial burning. The use of burning matches as before mentioned is good but many state that the wax taper is better, insuring immediate burning. When the sparks cease flying the operation is finished. It is advisable after cleaning carbon to grind the valves, but this should not be done if the engine compression is good. A little oil should be poured into each cylinder and the engine turned over a few times after the operation is over, because the flame leaves cylinder and piston dry.

2—3—To lap a piston or set of rings means to work them into a good fit, generally by means of friction and some suitable abrasive, as in grinding a valve. One speaks of grinding in a valve, but when treating pistons or rings in a similar manner the operation is termed lapping.

The equipment for lapping in a piston or set of rings usually consists of a long wooden connecting rod, an old piston pin and an old cylinder. When cylinders and pistons and rings become worn to any extent, the cylinders are rebored, new pistons are fitted, and these are then lapped in to assure good compression.

In repair work it is not customary to lap the pistons and rings in the cylinders in which they are destined to work; but in an old cylinder used only for the purpose of lapping in pistons and rings. It is customary in some shops to lap the pistons into their respective working cylinders when the pistons happen to be a little too large, but this is a practice that requires much care and skill on the part of the operator.

As the operation of lapping in a set of pistons by hand is quite a laborious one, it also is one that requires a skilled operator.

For lapping a piston in an old cylinder an abrasive consisting of a pasty mixture of fine carborundum and cylinder oil is used, while for lapping in a set of slightly oversized pistons in their own working cylinders, powdered pumice stone or rouge, such as is employed in polishing brass and nickel-plated articles, or very fine ground glass has been recommended. Water generally is used with pumice stone instead of oil.

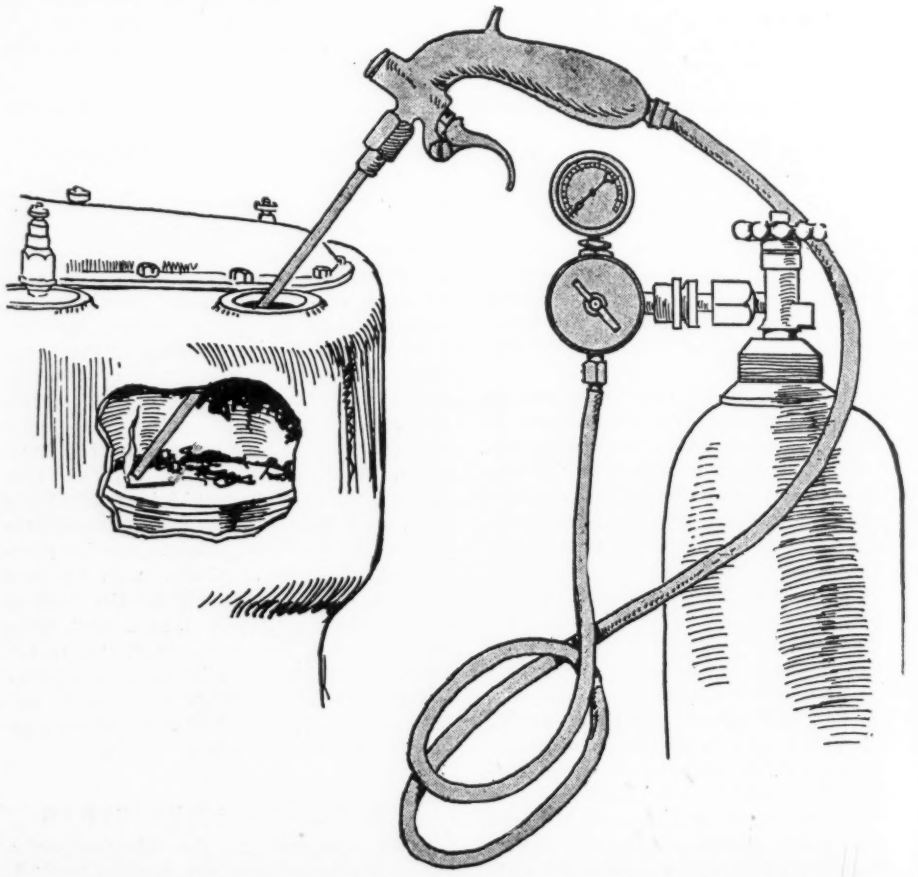


Fig. 1—Method of removing carbon by burning it out with oxygen. A lighted match is inserted into the cylinder to ignite the carbon deposits

When an old cylinder is used for lapping in pistons and rings, the rings should be removed as soon as they have received a smooth surface, then the piston should be frequently cleaned by rinsing in kerosene or water and tried in its working cylinder. When the piston begins to slide into the cylinder a little Prussian blue, lamp-black or red lead, such as is used in fitting plain bearings, may be used to see if it is a good fit. The rings also may be tested in the same way. After the operation is complete a thorough cleansing of the piston, rings and cylinders is most essential.

4—Counterbalancing in a Ford engine will reduce vibration a great deal but not sufficiently to warrant the installation.

CARBON

Q—Advise how to remove carbon from a model 9N Continental engine. The car has been run 7000 miles and has a decided knock on hills.—J. King, Highbridge, N. Y.

Due to the fact that this engine has no detachable head we advise having the carbon burned out by the oxygen method, which does the work effectively. The method is described in this issue. Some relief may be obtained by pouring about 1½ table spoonfuls of kerosene into each cylinder while the engine is hot and allowing it to stand over night. The kerosene will act as a solvent of part of the carbon and when the engine is started in the morning the loosened carbon will be blown out through the exhaust.

OILING SYSTEM ON 1916 CHALMERS 6-40—VALVE TIMING

Q—Publish a diagram of the oiling system on a 1916 Chalmers 6-40.

2—Give the valve timing.—Harry J. de Bock, Cleveland.

1—The combination force feed and splash oiling system is shown in Fig. 3.

2—To adjust the timing crank the engine until the inlet valve of cylinder No. 1 just starts to open. This point is reached when you are able to determine with the fingers that the valve rocker has started to raise the stem against the tension of the spring.

At this point the mark "in.Op." (inlet open) on the flywheel should be exactly centered with reference to the pointer on the rear of the crankcase. If the opening is not correct, rotate the flywheel to bring this mark directly on center and adjust the valve rocker-arms so that it will be just opening itself at this point. This adjustment is made as previously explained. It is essential

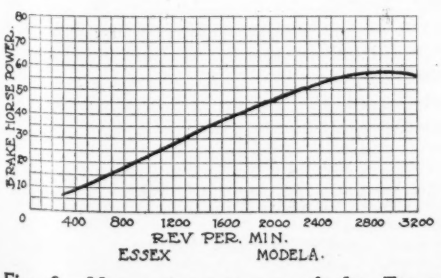


Fig. 2—Horsepower curve of the Essex engine

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

Engines

H. L. Stahlman.....Newman, Calif.
J. King .....Highbridge, N. Y.
Harry J. de Bock.....Cleveland, Ohio
Halph J. Chandler.....Ogdensburg, N. Y.
O. Radesple .....Peoria, Ill.
Frank A. Pelican..Hillhead, S. Dak.
John Humphreys, Johnson's Garage .....Jackson, Tenn.
A. L. Bye.....Cedar Rapids, Ia.
Mester Bros.' Garage....Bismark, Mo.
Earl Downer.....Batavia, N. Y.
F. Herbert Gile.....Braintree, Mass.
Mechanical Trades Institute of P. N. A. College.....Cambridge Springs, Pa.
Ed. Gerloff.....Phoenix, Ariz.
Julian Anderson ..... Elkerton, Ia.
Raithel's Garage.....Osage City, Mo.
T. R. Halsell.....Transylvania, La.
V. R. Withers.....Mattawan, Mich.

The Electric System

Arthur Jergenson .....Billette Grove, Iowa
C. Bowden.....Brooklyn, N. Y.
Joseph Yaho....East Pittsburgh, Pa.
A. M. Kirk, Yazoo Motor Sales Co. .....Yazoo City, Mich.
Fownes Compton .....Philipp, Miss
Harry J. de Bock.....Cleveland, Ohio
J. W. Zeringue.....Falgiers, La.
Clark & Shepard Hopkinsville, Ky.
E. Forsgrn & Sons....McGregor, N. D.
The King of Trails Garage..... Stringtown, Okla.
Herman Schott.....East Akron, Ohio
Howard G. Hunt.....Macedonia, Ohio
Reader .....New Castle, Pa.

Miscellaneous

H. H. Brustad.....St. Paul, Minn.
Geo. Carlsted.....Purdin, Mo.
Jerry DeNooyer....Kalamazoo, Mich.
Carl Shepherd..... .....Newark, Ohio
L. J. Gibson.....Little Rock, Ark.
Earl J. Offers.....Geneseo, Ill.
Julian Anderson .....Elberon, Ia.
M. W. Zimmerman..... St. Petersburg, Fla.
Wallace M. Hicks.....Amboy, Ill.
K. E. Grenette.....Duluth, Minn.
Frank Jaeger.....Freeport, Ill.

Rebuilding

James E. King.....Wichita, Kans.

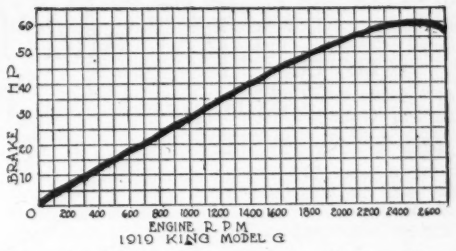


Fig. 4—Horsepower curve of the King 8-cylinder Model G engine made in 1919

that these adjustments shall always be made with the "back lash" or lost motion in the driving gear entirely taken up in the same direction, that is in the direction of the rotation of the engine when running.

Turn the flywheel a short distance in the same direction, bringing the mark "ExCl." (exhaust closes) to the center with reference to the pointer. With the flywheel mark in this position, the exhaust valve on the No. 1 cylinder should just start to close. If not, adjust the exhaust valve rocker arm as described above. This operation should be repeated for each cylinder.

ESSEX POWER CURVE

Q—Publish B. H. P. Curve of Essex Model A, as well as its maximum speed with touring body.

The Essex Model A with B. H. P. curve shown in Fig. 2 when equipped with a touring body will make about 65 miles per hour.

POWER CURVES

Q—Publish power curve showing the maximum horsepower developed by the King 8-cylinder Model G 1919 car.

2—What is the maximum speed that a stock model G King Foursome will attain.

3—What is the rear axle ratio of this car.

4—Publish power curve showing maximum horsepower developed by the Oakland 8 model 50.

5—What is the maximum speed that this car will develop?

6—What is the rear axle ratio of this car?—Ralph J. Chandler, Ogdensburg, N. Y.

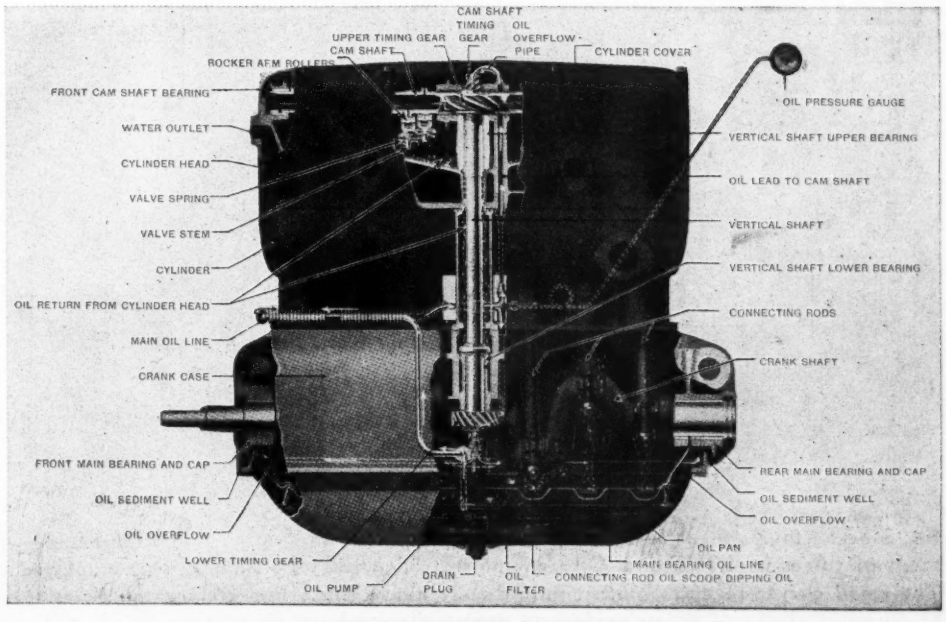


Fig. 3—Lubrication as used on the 1916 Chalmers 6-40 engine

Otto and Brayton Cycle

Differences in the Two Systems Explained

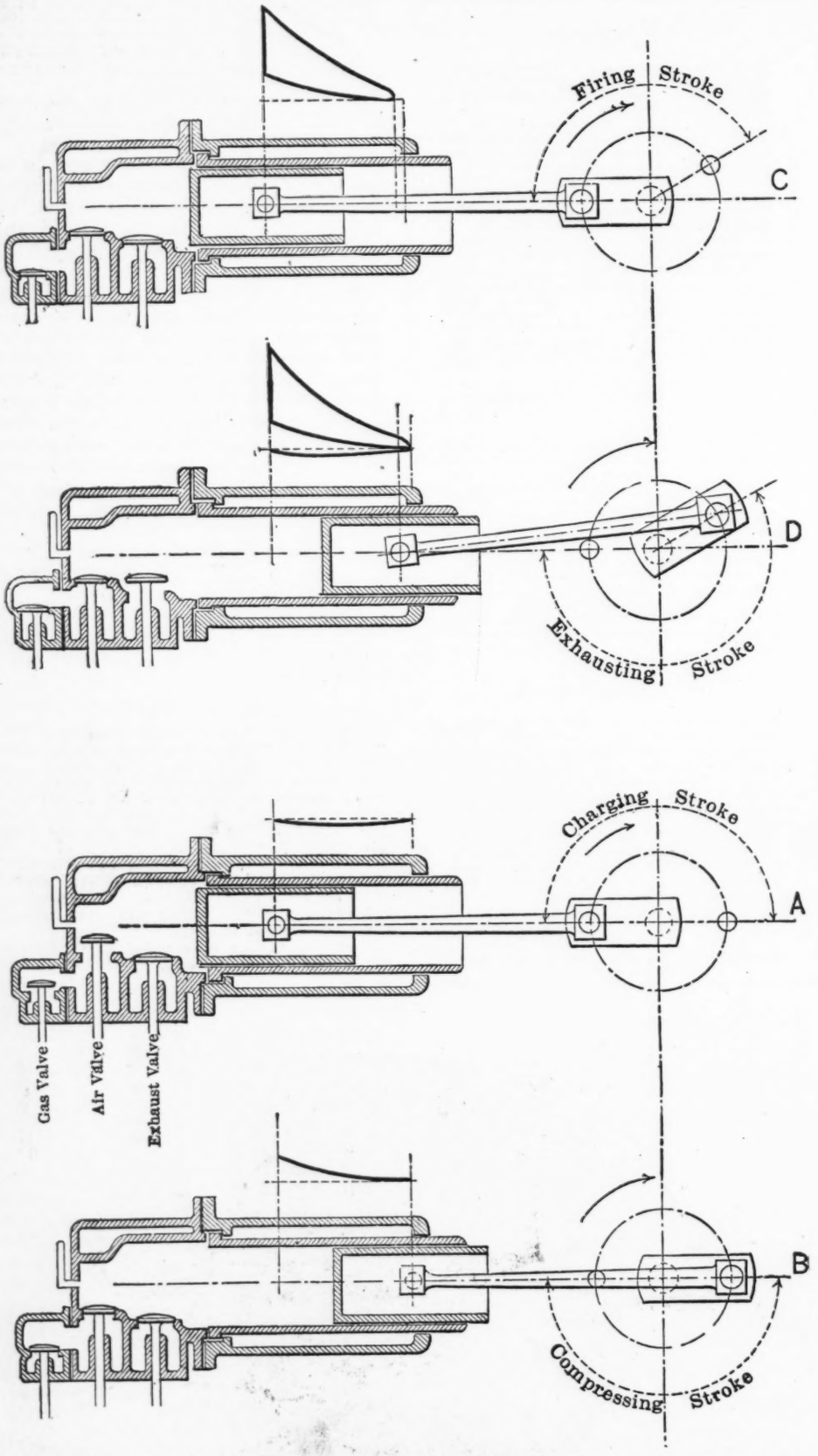


Fig. 5—The four strokes of the Otto-cycle engine. The illustration shows the arrangement of valves in the original Otto engine on which hot tube ignition was employed. The small curves that are plotted immediately above the cylinder show the functions performed during the stroke

1—The power curve of the 8-cylinder 1919 King model G is shown in Fig. 4.

2—The maximum speed of the King Foursome is about 65 a.h.p. under average conditions.

3—The rear axle gear ratio is 5 to 1.

4—As we have no available information as to the maximum horsepower developed by this car we cannot publish the brake horsepower curve but the S. A. E. rating is 39.20.

5—This car will develop about 55 m.p.h. under average conditions.

6—The rear axle ratio is 4.08 to 1.

THE OTTO AND BRAYTON CYCLE

Q—Explain the difference between Brayton and Otto cycle.—Ed Gerloff, Phoenix, Ariz.

The principle of the Brayton cycle is the compression of a mixture of inflammable gas and air which is introduced into the working cylinder and there ignited so as to burn in such a manner that the pressure shall not increase above a fixed constant value. The power is generated by the increase of volume at constant pressure due to burning of the gas in the air. Such engines are not explosive but the pressure increases, due to slow combustion.

The Brayton engine shown in Fig. 7 had the air compressed in the pump B, whose volume was one-half that of the power cylinder A. The constant pressure tanks at the base of the frame delivered the air through the pipe (O) in Fig. 6 which is the burner for the oil engine and passed it through the absorbent material or wick (b) to which the oil was fed by a pump. The air and fuel combine here so that the air becomes carbureted and passes through a wire-gauze grating (p) into the cylinder (d) where it burns on meeting the flame on the bottom of the gauze. The air is never completely shut off by the admission valve, but enough always flows through (f) to keep a small flame alight.

The Otto cycle is representative of the present internal-combustion principle. A mixture of gas and air in proper proportions is drawn into the cylinder during an (outgoing stroke) of the piston and is called the intake stroke. The mixture is compressed by the return of the piston and is called the compression stroke. The compressed mixture is ignited by some acceptable and reliable device such as magneto and spark plug. This causes the pressure to rise at once and exerts its effort to drive the piston outward. The gas expansion is followed by a gradual lowering of the pressure during this working stroke. The exhaust opens and the burnt gases are discharged into the air through the exhaust valve by the return of the piston. This cycle takes two revolutions of the crankshaft. The cycle then repeats itself. The position of the piston at the beginning of each stroke in the cycle is shown in Fig. 5.

SMOKING

Q—On a 1918, twelve-cylinder National car there is a continual smoking through the exhaust, even after the engine is hot, which continues regardless of the carbureter and oil pressure adjustments. Engine runs smoothly but does not have the power or speed it should. What is

the cause of this and how can it be remedied?—O. Radespiel, Peoria, Ill.

This situation seems rather illogical as the smoking through the exhaust may be caused by carbureter and oil pressure adjustments or a carbon deposit in the engine. If carbon was present the car would not run smoothly and it would show lack of power and speed as well. It is impossible to state exactly what causes lack of power or speed but may be the result of poor carburetion, incorrect timing adjustments of the distributer, lack of compression, or improper seating of the valves which might be caused by carbon deposit.

We believe that if the carbon is removed, the valves reground and the carbureter properly adjusted the car will regain its speed and power and in all probabilities the smoking through the exhaust will stop.

OIL PRESSURE ON A DODGE

Q—Advise how to regulate the oil-pressure on a Dodge car.—Frank A. Pelican, Hillhead, S. D.

With plenty of oil in the engine if the gage does not show a slight pressure when the engine is running at a speed corresponding to a car speed of 15 to 25 miles per hr., the clutch should be pushed out and the engine accelerated. If there is no indication of oil pressure after this acceleration, there is evidently trouble in the oiling system. The strainer, oil feed tubes, oil pump or oil feed pipe in the crankcase may be clogged. If there is an excessive indication of pressure on the oil gage when running at a low speed, it is probable that the oil feed tube from the pump is clogged. In either event remove the strainer and see that it is clean. Then inspect the oil pump and oil feed tube. If they are all clear and the pump vanes turn properly when the crankshaft is rotated the trouble is in the oil feed pipe inside the crankcase. This can be cleaned out by blowing through the pipe with compressed air.

EXHAUST PIPES

Q—Am rebuilding a Paige 6-39. Where can individual fenders and 3 in. tubing for the outside exhaust pipe be secured? —Jno. Humphreys, Johnson's Garage, Jackson, Tenn.

Naturally enough you can buy fenders from the Paige-Detroit Motor Car Co., Detroit, or you can have them made to suit your individual tastes, but you would have to supply a design and have the work done by some fender maker, many of whom may be found in the advertising columns.

An outside exhaust pipe may be made from Shelby steel tubing and this can be obtained from the National Tube Co., Frick Bldg., Pittsburgh.

ENGINE KNOCKS

Q—There is a knock in a 1917 Ford engine. It seems as though a connecting rod were very loose, but the knock does not sound as dull as such a knock usually is. The knock can only be heard when the engine is idling or descending hills. When the engine is pulling hard the knock cannot be heard. Oversized pistons have been installed main bearings, camshaft gears and bearings, carbon removed. Could the timing gear be sprung? New wrist pins and bushings were installed.—Mester Bros.' Garage, Bismark, Mo.

If you do not hear the knock when the engine is under a pull, as ascending a grade, we are inclined to believe the flywheel is loose; yet there is the possibility that the crankshaft is out of true, or possibly the connecting rod is not square with the crankshaft end. It is well when overhauling an engine to be careful that the connecting rods and pistons are squared up, otherwise noise will develop and damage will accrue to the cylinder walls and pistons.

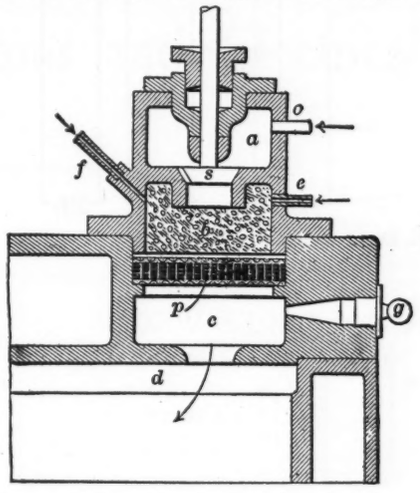


Fig. 6—The carbureting and gas mixing passage in the engine showing the chamber where fuel and air enter

SELF-ALIGNING PISTON

Q—Do you know of anybody who has made or patented a self-aligning piston and connecting rod assembly in this country? I saw an illustration of one made by an Englishman on the ball and socket principle. Could you give me an idea of what they are like, and if the idea is practical and what the advantages would be?—Earl Downey, Batavia, N. Y.

So far as known no American manufacturers are using the practice referred to and while it appears that it can be successful it also would seem to be a manufacturing proposition involving too heavy a cost, due to the fact that the work would naturally have to be of a more careful nature. At the same time we are inclined to believe that this process would bring about more weight at the top of the connecting rod than where the old-fashioned wristpin is used. In order to save excessive wear it would be necessary to use some form of bearing metal and this would call for delicate work, otherwise the wear would be rather excessive and would call for frequent adjustments for wear.

BACKFIRING

Q—I have a 1919 four-cylinder Studebaker which back fires with open throttle at speeds of 16 to 20 miles on a fair grade. Easing up on the throttle stops the backfiring. It is impossible to get too

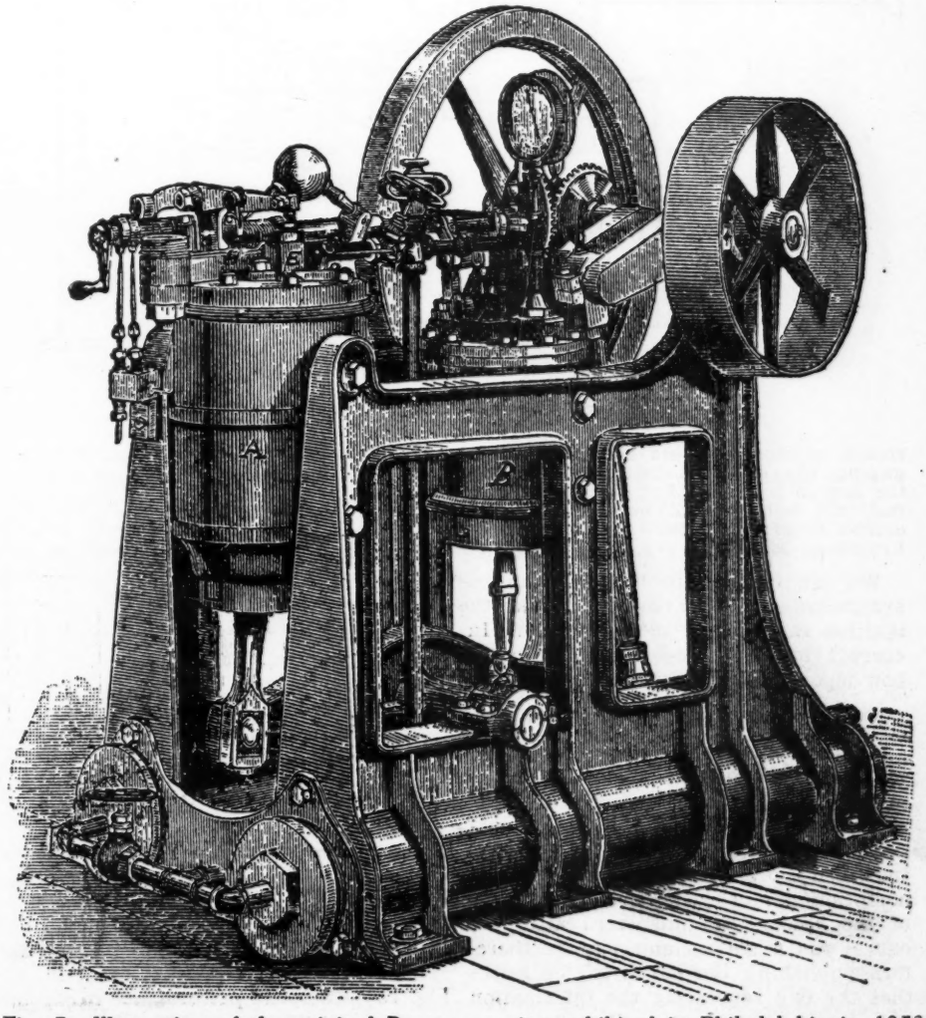
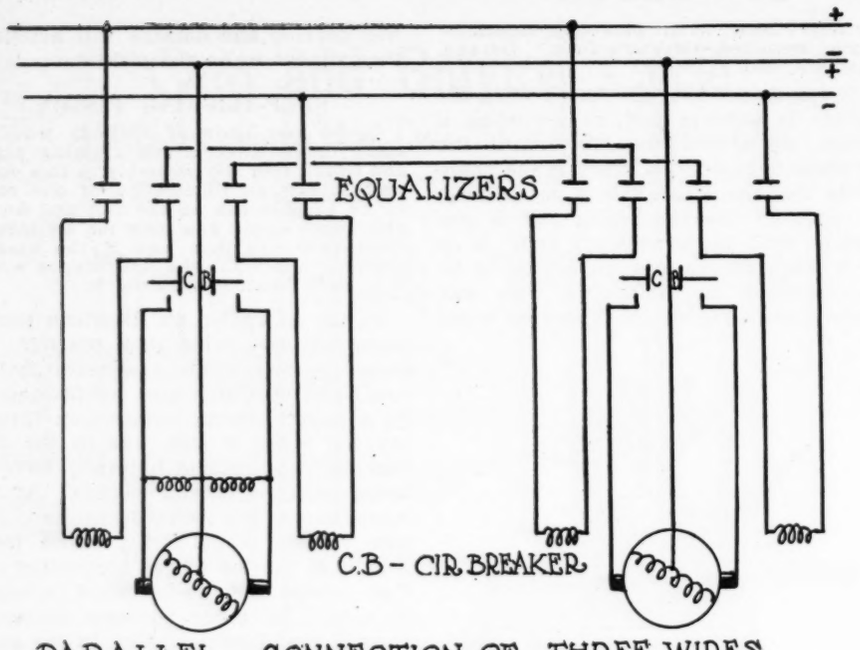


Fig. 7—Illustration of the original Brayton engine exhibited in Philadelphia in 1873



PARALLEL CONNECTION OF THREE WIRES COMPOUND — WOUND GENERATORS.

Fig. 8

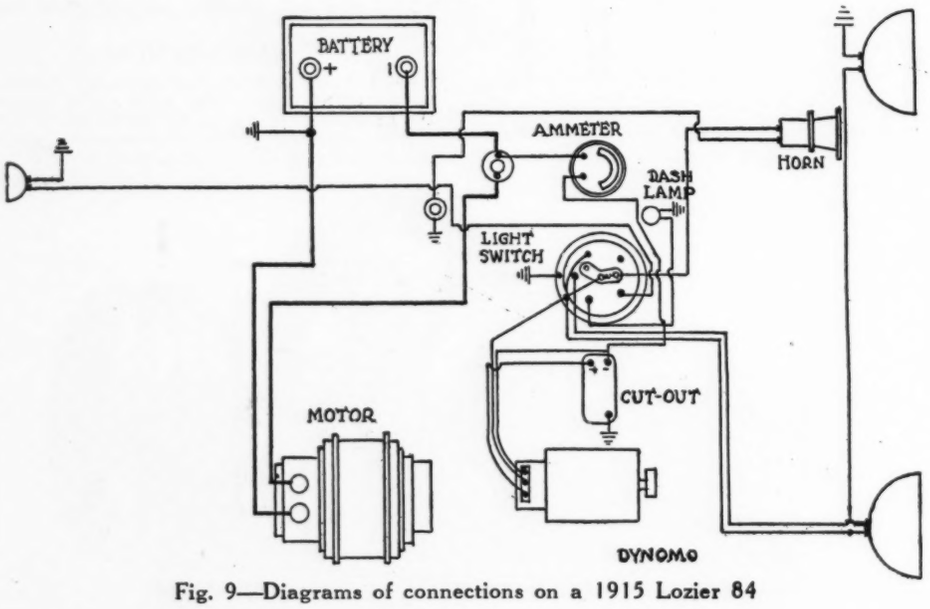


Fig. 9—Diagrams of connections on a 1915 Lozier 84

rich a mixture. Would you advise, first gaging the opening, then drilling until the engine gets sufficient gas. Should this fail the holes could be soldered then drilled to original size.—F. Herbert Gile, Braintree, Mass.

We are inclined to believe from the symptoms given that the fault is with the ignition rather than the carbureter. Incorrect timing or pre-ignition due to carbon deposit would cause backfiring.

ENGINE PERFORMANCE CURVES

To the right is the curve requested by a reader desiring the performance curves of some average four-cylinder engine, showing the horse power, torque, thermal efficiency, mechanical efficiency, indicated horse power and fuel consumption curves. The original request of the reader was misplaced after the curve was made up and we are therefore publishing the curve in the hopes that the one requesting the information will obtain it without further delay.

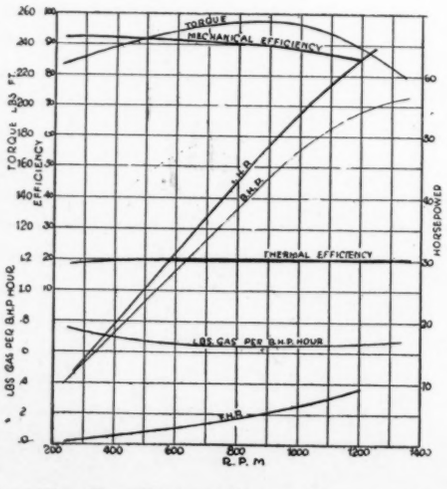


Fig. 10—Complete performance curves on the Continental engine

SPARK PLUGS

Q—Was hard fibre ever used in spark plugs in place of porcelain?

2—Why is it that the porcelain does not fit the lower inner-room of the spark plug exactly? If it did so, would this not eliminate the trouble caused by carbon collecting in this space?—Mechanical Trades Institute of P. N. A. College, Cambridge Springs, Pa.

1—We do not believe that hard rubber was ever used in place of porcelain.

2—Why the porcelain does not fit the inner-room of the spark plug is a matter of opinion as to proper design. So far, the question of eliminating carbon deposits on sparks has not been completely solved.

BACKFIRE

Q—Explain what causes a gas engine which it must do in order to backfire to fire through an open intake valve through the carburetor) when mixture is lean?

2—What is the proper way to test for burned out condenser ?

3—Recommend or publish any good works; also authors on Diesel engines.—Ed. Gerloff, Phoenix, Ariz.

1—This is due to the fact that a lean mixture causes a slow burning charge and fires when one of the valves is open.

2—You can tell when the condenser is out of order or punctured by the fact that there will be arcing at the breaker points, and these will be badly eaten away or burned off. This again will have the effect of advancing the firing point and may prove dangerous.

3—We know of no specific authority on the book shelves that is devoted specifically to the Diesel engine. There are a number of authorities that will give you a pretty good idea of the engine, however, and if you will write the A. P. Book Co., New York, you will be able to obtain what you desire.

KNIGHT ENGINES

Q—Name the 1919 cars equipped with Knight engines.

2—Was this an increase or decrease over previous years?—Julian Andersen, Elberon, Ia.

1—The Moline Knight now the R. & V. Knight, the Willys-Knight and the Stearns-Knight were equipped with Knight engines.

2—For 1919 the Knight engine was installed in 4.2 per cent of the chassis models and for 1920 this figure decreased to 3.04 per cent. The 1918 percentage was 4.0. The general tendency is toward a reduction of the Knight sleeve-valve engine. In Europe this is particularly true.

ENGINE CRANKS HARD

Q—The engine of a 1918 Oakland Six model 34 is hard to crank. The starter cannot budge it. The cylinder oil is thin and becomes so in a few miles of running. The car does not run smoothly. It has only been driven 2000 miles. Is it possible that the piston rings are of no account or probably they don't fit tightly. —Raithel's Garage, Osage City, Mo.

This engine is equipped with aluminum pistons which have a tendency to heat after a short time of running. The cylinder oil gets by the pistons and in a short time becomes very thin. When heated the pistons become rough and

seize. This seizing action is probably what causes the engine to crank hard.

SQUEAK IN OLDSMOBILE

Q—A 1916 8-cylinder Oldsmobile, model 44, produces a squeaky noise that seems to come from the region of the engine. The starter, generator, clutch and gears have been overhauled and appear to be well oiled and in good condition. The engine and bearings are O. K. and the noise is not caused by the springs. When engine is idling or at high speed without a load or running at 3 to 5 miles per hour on the road this squeak is heard only occasionally but when running faster and steadier the noise increases. Could you explain the cause of this and what should be done to eliminate it?—V. R. Withers, Mattawan, Mich.

It is impossible to say just what causes this squeaky noise as it may come from any two pieces of metal rubbing together. In all probabilities it is part of the hood or pan. The only way to determine the cause is by process of elimination.

KNOCKS

Q—A Ford truck causing trouble by crankcase knocks. The connecting rods fit snugly around the crankshaft but have a loose end wire motion (lengthwise with crankshaft). Is this a side knock. Will a new connecting rod remedy this trouble?—T. R. Halsell, Transylvania, La.

This knock is evidently a bearing knock and the thing to do is to put in a new connecting rod and bearing as soon as possible.

Wiring Diagrams and Electrical Principles

HEADLIGHTS ON 1915 BRISCOE

Q—Has a law been inacted lately which calls for two headlights on all cars?

2—If so, in what way could two headlights be fitted besides doing away with the one headlight and still not affect the appearance of the car?

3—The car has been driven about 7000 miles and seems to have excessive lateral play in the rear wheel hub bearings. What would cause this and give adjustment? Car is equipped with Hyatt roller bearings. Lubrication has always been sufficient.

4—Show how to dismantle clutch and instruct how to renew the leather facing. —Arthur Jergenson, Gillette Grove, Iowa.

1—Sec. 25 (c) of the Iowa Motor Vehicle Law states that all motor vehicles in use on the public highways, excepting motorcycles, motor-bicycles, and such motor vehicles as are properly equipped with one light in the forward center of such motor vehicle, shall during the period of from one-half hour after sunset to one hour before sunrise, display two or more white or tinted lights, other than red, on the forward part of said vehicle.

2—Lights with brackets that can be bolted to the frame may be purchased and placed on the car at a low expense. In order to keep the good appearance of the car the headlights now used will have to be left as it is. Wiring diagram is given in Fig. 13.

3—This excessive lateral play is caused by the worn roller bearings. It is natural that the bearings will wear to a certain extent regardless of the lubrication. These bearings can be adjusted by removing the hub cap and retaining plate and turning up the adjusting nut.

4—The clutch leather may be removed by taking out the cone and cutting the copper rivets which hold the leather. In putting on a new leather care should be taken to have the head of the rivets well below the surface so that they will not strike the outside cone. To remove the clutch from the flywheel disconnect the universal joints and loosen the bolts which fasten the outside cone to the back face of the flywheel. After these bolts are removed, the entire clutch assembly will come out. At the back of the clutch cone, just inside the universal joint, there is a bronze bushing which supports the clutch on the extension of the crankshaft. This bushing may be replaced when worn.

The clutch operating collar which is located on the driving shaft of the car is held in place by a clamping screw, which may be set in any of three notches on the driving shaft. If the collar is set too far ahead on the driving shaft the operation of the clutch pedal will not throw the clutch entirely out. If it is set too far back on the driving shaft, the pedal may throw the clutch out too far so that it will bind against the flywheel, and make a grating noise when completely disengaged. The collar should be so placed that when the clutch is in, there will be a slight amount of play between the pedal and its rest. This will insure the whole force of the clutch spring on the clutch itself.

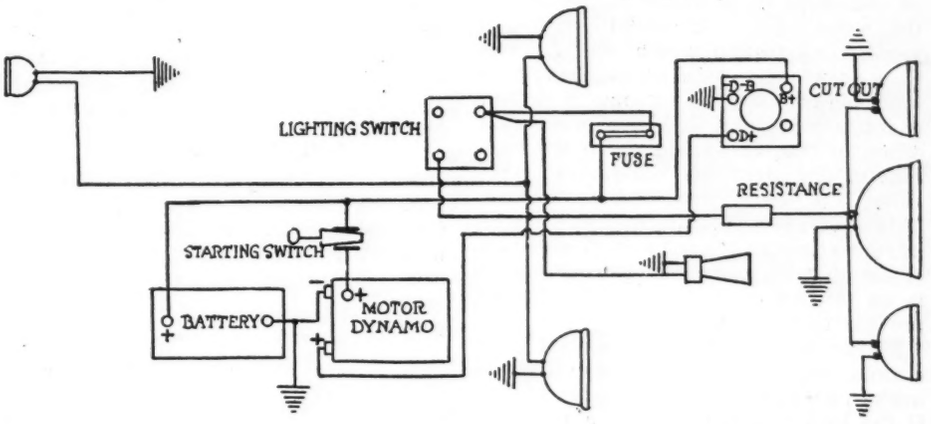


Fig. 11—Wiring diagram of the 1915 Briscoe showing connections for auxiliary headlights

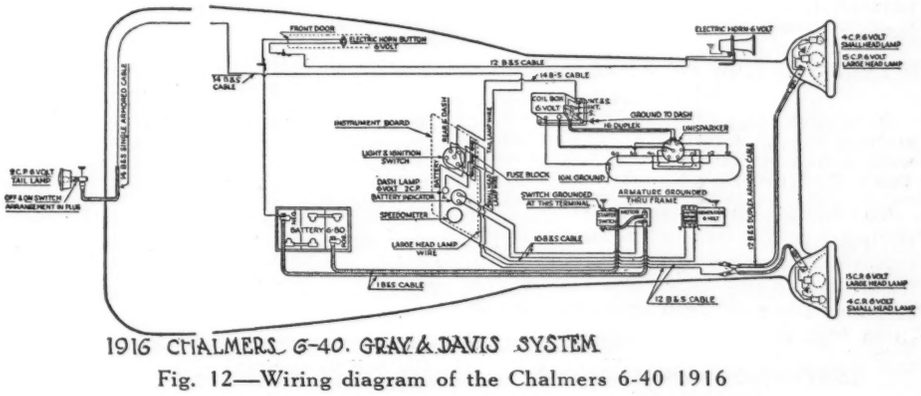


Fig. 12—Wiring diagram of the Chalmers 6-40 1916

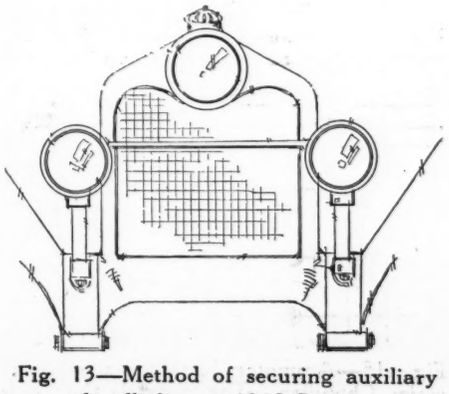


Fig. 13—Method of securing auxiliary headlights to 1915 Briscoe

WIRING DIAGRAM FOR LOZIER

Q—Publish wiring diagram of the 1915 four-cylinder Lozier.—C. Bowden, Brooklyn, N. Y.

In Fig. 9 is shown the Gray and Davis electric system used on the 1915 Lozier.

PARALLELING GENERATORS

Q—We have three dynamos, one big 50 k.w. interpole; and two small compound about 15 k.w. each, delivering from 110 to 120 volts each, direct current. We desire to connect all three dynamos to one line. Is it possible to run all three dynamos at the same time and deliver current to the same line? If so, show how to con-

nect them with the main line. Each dynamo is run by a gasoline engine. If it will be necessary to connect in the circuit of the small dynamos a cutout to prevent the discharge of current from the large dynamo to the small dynamos which discharge current probably would make the small dynamos run as motors?

2—Which company makes an automatic suitable for this purpose?

3—Could we divide the current of the large dynamo in two main lines, east and west, each having extra switch and connect one small dynamo to be run at the same time with the big dynamo for the east line and the other small and large dynamo for the west line? Publish sketch of this combination.—Stanley Malicki, Hillsboro, Kans.

1—2—The generator mentioned cannot be connected so as to deliver current to the same line. It would require a parallel connection which would result in a very badly unbalanced load. The interpole machine due to some of its bad characteristics and the unbalanced condition of the line would cause the current in the compound generators to reverse, and they would run as motors. This reversal would undoubtedly speed up the compound machines to such an extent that they would run away. There is no method of providing a cut-out to prevent this action.

3—The two fifteen kw. compound generators may be run in parallel by the use of two equalizers as shown in Fig. 8. If the load will permit it would be advisable to run the fifty kw. so as to feed either the east or the west line and the two compound generators connected in parallel to supply the remainder of the load.

INSTALLATION OF AMMETER ON FORD

Q—Explain and illustrate method of installing an ammeter on a Ford equipped with a General Motor generator.—Joseph Yaho, E. Pittsburgh.

To install an ammeter on a Ford equipped with a General Motor generator remove the jumper wire from the starting switch to the cutout and connect the ammeter leads between these two points as in Fig. 14.

INSTALLING AMMETER ON CHANDLER

Q—Publish diagram for ammeter on the new Series Chandler.—A. M. Kirk, Yazoo Motor Sales Co., Yazoo City, Miss.

The ammeter installation on the new series Chandler is shown in Fig. 15.

TIMING OF IGNITION

Q—Show how to wire headlights to a Bosch magneto.

2—Explain why an engine has increased speed when the charge is fired before piston reaches top dead center.—Fownes Compton, Philipp, Miss.

You cannot use a DU4 for lighting inasmuch as the voltage is too high for any bulbs to stand the pressure.

2—It requires a little time for the propagation of the gases after being ignited by the spark and in the meantime the piston has traveled upward a little. It has just begun its downward stroke when the blunt of the explosion takes place. This is the reason for advancing the spark, so it will give time for the gas to become fully ignited. If the gas were fired at top center then the gas would not be under full compression when the propagation is complete and much of the force of the explosion would be lost. Again too much of the cylinder walls would be exposed to the heat and heating would ensue, due to a slow burning charge. The idea is to have the gas fully fired at the highest point of compression. Gas does not develop power unless it is confined, just as a firecracker does not make much of an explosion when it is broken open; it makes a squib.

IGNITION ON CHALMERS 6-40

Q—Publish a wiring diagram of the Atwater-Kent ignition system on a Chalmers 6-40.—Harry J. de Bock, Cleveland.

According to our records the 1916 is equipped with the Gray and Davis electric system. This is shown in Fig. 12.

ABOUT THAT SHOCK

Falgiers, La.—Editor Motor Age—On page 41, November 20 issue, a reader asks about a shock received from a magneto on a Bosch dual system when the switch is thrown to the magneto side.

I met with similar trouble six years ago. The coil is mounted on a wooden dash and is insulated from the metal parts of the car. In this case, a wire should be run from the ground terminal No. 6 on coil to the engine frame, or some metal part of the car. If the coil were mounted on a metal dash this wire would not be needed as the coil would be grounded through coil frame.—J. W. Zeringue.

DIM LIGHTS

Q—The lights of a Dodge car model 18 have been giving trouble. When turned on they will burn all right until the engine is speeded up, then they become dim and a discharge is shown on the ammeter. The battery is connected right and the negative is grounded. The wires were changed and the ammeter and lights were all right, the ammeter registering charge. Why would changing the wires on the ammeter have anything to do with the way the current goes through the battery in the wrong direction? Wouldn't that cause the lights to become dim?

2—Why do they run the small wires to the positive side of the battery instead of the positive side of the starting switch on 90 Overland?—Clark & Shepard, Hopkinsville, Ky.

1—It is evident that you have interchanged the wires that run from the reverse current relay to the ammeter. The effect of this wrong connection is a reversal of the direction of flow of the current in the coils of the relay and will result in the ammeter reading discharge and the lights becoming dimmed when the engine is speeded up.

2—The small wires mentioned could be connected to the positive side of the starting switch just as well as to the positive side of the battery but probably the Overland Co. found it more convenient to run the wires to the battery.

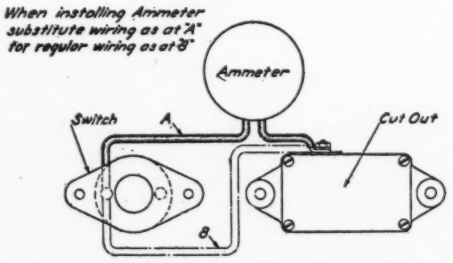


Fig. 14—Connections for installing ammeter on Genemotor system on Ford car

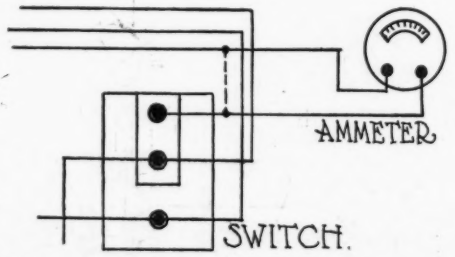


Fig. 15—Ammeter installation on new series Chandler. The panel is the lighting switch on the dash board

REWIRING OF GRAY AND DAVIS GENERATOR

Q—Can an old motor generator which is the starter and generator of a 1914 or 15 model Gray & Davis Ford starting and lighting system be rewired so it could be used on a 32 volt D. C. and could it be made to work with a fair degree of efficiency? It is to be used for variable speed and variable load so it would have to be series wound. Would a shunt winding be advisable besides the series making it a compound? Should the series field winding be taped off and led out to a slide switch so as to cut in or out more or less of the field winding to vary the speed or would a rheostat in the main line be enough? Could both systems be employed to advantage? If this job can be done state figures on the amount and size of wire required, the number of turns for fields and armature and what power it would deliver. Also give name of some concern where we can get resistance wire.—E. Forsgren & Sons, McGregor, N. D.

It is impossible to generate 32 volts without the use of a storage battery that would supply about 18 or 20 volts to a shunt field. This kind of a connection would give very inefficient results and if adopted would undoubtedly burn out the winding of the generator in a short time.

RECTIFIER

Q—Is there a successful rectifier made for charging storage battery from a Ford magneto? If so please give dealer's address.—The King of Trails Garage, Stringtown, Okla.

We have heard of such of a device but have no available information as to the manufacturers. It is our opinion that this type of rectifier is not very successful.

IMPURE ELECTROLYTE

Q—I have a 6-volt, 80-ampere-hour battery that will not charge. Sometime ago I put in a good grade of new separators and new solution of 1200 specific gravity. It was put on charge at 4 amperes for three or four days but the gravity came up to 1150 and will not rise higher. More acid was added but the gravity is still at 1150. There is no sulphate on the plates and when charging it at four amperes it will gas as though fully charged. Would impure acid or iron in the solution cause this?—Howard G. Hunt, Macedonia, Ohio.

The limiting values of the percentages of impurities given by Heinz are as follows: Iron .01 per cent, chlorine, .002 per cent, nitrogen, .01 per cent. It is evident that the electrolyte contains impurities

which are interfering with the charging action of the battery.

DOUBLE SPARK IGNITION

Q—What advantage has double spark ignition in an L-head engine?
2—What company manufactures these double plugs?—Herman Schott, East Akron, Ohio.

1—Double spark ignition is used on cars built for speed and on some high-priced cars. This system is considered most reliable and will give a great amount of speed. It gives the advantage of starting the flame from two points in the cylinder.

2—Two plugs are used and may be obtained from almost any ignition company such as Bosch or Delco.

TREATMENT OF NEW BATTERIES

Q—What specific gravity should the electrolyte be for a new battery, that is one that has never had electrolyte in or one that has been shipped dry?
2—How long and at what rate should such a battery be charged?
3—Explain how to treat separators that have been shipped dry without having been previously treated?—Reader, New Castle, Pa.

1—Where new elements are used some authorities advise the use of an electrolyte of 1.375 specific gravity for some types of batteries and 1.330 for others. Be sure that the electrolyte is pure as the presence of impurities in excess such as iron and platinum will cause a lot of trouble.

2—The charging rate and length of charge depends upon the rated capacity of the battery. It is not advisable to charge at a greater rate than 6 to 8 amp. and it will require about 24 hr. to get it up to full charge. In case new elements are used, charge the battery at one-half this amount for about 50 hr., the test for full charge being that all the cells are gassing freely and there is no indicated rise in specific gravity or voltage over a period of 5 hours.

3—The separators when received from the factory are treated and if it is necessary to keep them on hand place them in a solution of electrolyte and distilled water.

Miscellaneous

Q—What is the meaning of N. A. C. C.?
2—What method is used in rating gas engine horsepower?—H. H. Brustad, St. Paul, Minn.

1—N. A. C. C. means National Automobile Chamber of Commerce.

2—Generally speaking the N. A. C. C. formula, which is the same as the old S. A. E. formula, being

$$D^2 \times N \times .4$$

wherein D is the bore of the cylinder in inches, N the number of cylinders and .04 a constant that has been determined. The old formula was

$$\frac{D^2 \times N}{2.5}$$

The result is the same, however. The stroke has, in this formula, been taken into consideration in the constant, an average having been used when the formula was made up.

BURNT OUT BEARINGS

Q—On a Cadillac 8, the center main bearings burn out very often, which results in a hump on the crankshaft where the oil groove is in the bearing.—Jerry De Nooyer, Kalamazoo, Mich.

The lubrication of Cadillac eight-cylinder engines is by oil under pressure and is regulated by an over-flow valve or pressure regulator containing a valve under spring tension. In a system of this kind it is important that the oil be replaced at the end of each 500 miles of travel and the system thoroughly cleaned with a mixture of kerosene and engine oil. During cold weather it is necessary to replace the oil at shorter distances due to the fact that a certain amount of water may accumulate in the crankcase of the engine as a result of condensation. The water thus formed either freezes, preventing the pump from drawing oil, or mixes with the oil, forming a thick substance which the pump cannot draw.

We recommend that the lubrication system be taken care of according to the instructions given by the Cadillac Motor Car Co., as the frequent burning out of the main bearing can only be caused by lack of a proper amount of oil being forced to the main bearings.

AXLE TROUBLE.

Q—The left axle shaft on a 1912 Buick 28 has been broken. Will it be necessary to disassemble the entire rear axle?
2—Can 34 by 3½ straight-side casings be secured?
3—Where can wire wheels of standard size be secured?—Geo. Carlsted, Purdin, Mo.

1—This is a semi-floating axle and in order to remove broken parts it will be necessary to disassemble the entire axle.

2—34 by 3½ straight-side casings may be secured from the Dunlap Tire Sales Co., 1808 Broadway, New York.

3—Wire wheels can be obtained from companies advertising in the columns of the MOTOR AGE.

MARMON 34 CHASSIS

Q—Publish overhead view of the Marmon 34 chassis.
2—Give list of cars using a clutch of metal-to-metal disks running in oil.—Carl Shepherd, Newark, Ohio.

1—Airplane view of Marmon 34 chassis is shown in Fig. 16.

2—See Specifications in the Jan. 29 issue of MOTOR AGE.

CLASHING GEARS

Q—A 1918 Dodge Brothers car has been run about ten thousand miles. When the car had been run about five thousand miles the transmission was filled too full of grease and it worked into the clutch, causing it to slip. The car was taken to the Dodge service station and they washed it out with gasoline and put Fullers earth between the plates on the clutch. Now, when the gears are disengaged allowing the clutch plates to close and the clutch is released, and on

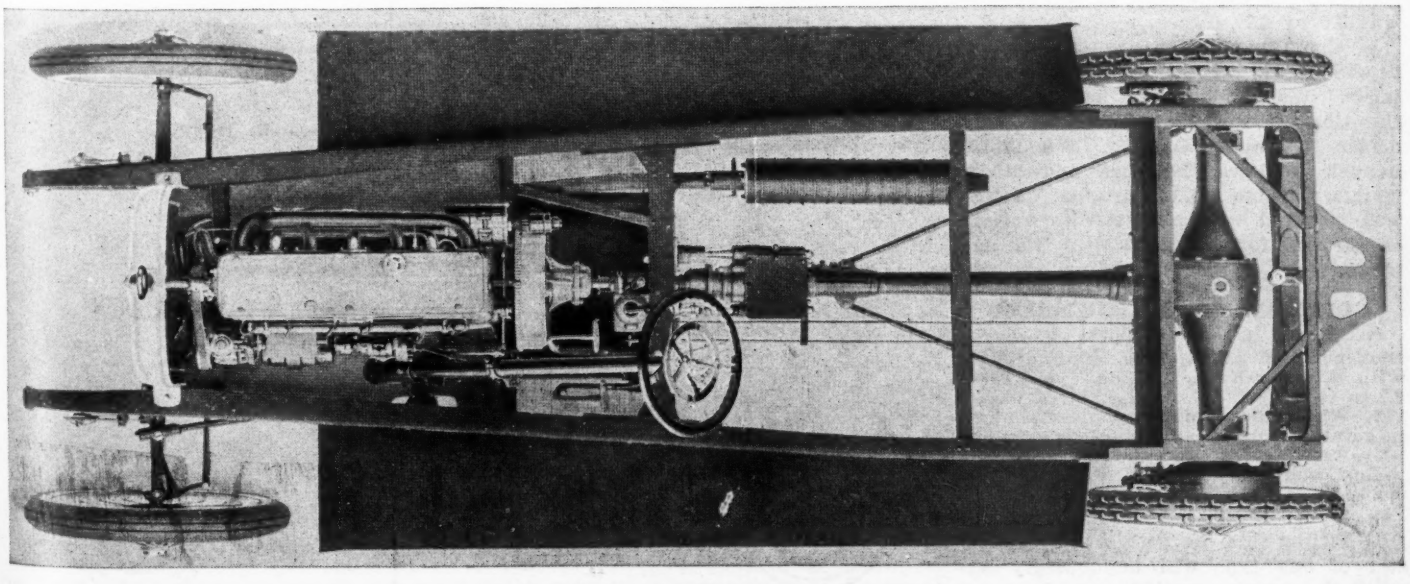


Fig. 16—Airplane view of Marmon 34 chassis

an attempt to engage the gears again the plates stick so badly that they clash the gears and when they do engage the car jumps forward and often kills the engine. It has been washed out a number of times with gasoline, but without success. Can you offer a remedy?—L. J. Gibson, Little Rock, Ark.

The clutch disks are covered with a wire-woven asbestos and it is practically impossible to remove the Fullers earth after it has worked into the fabric. The proper remedy is to remove the clutch plates and have them recovered. In addition to the fact that grease may have worked into the clutch the writer believes that the slipping was caused by the fabric being worn as a result of slipping the clutch. While driving, never ride the clutch with your foot as it will result in wearing the fabric until it becomes glazed and loses its gripping power.

RACING CAR INFORMATION

Q—Were special engines used in the Hudson racing cars, or were they the standard touring car engine?

2—Was the Knight sleeve-valve engine used in any racing cars? If so, name the cars, give speed and bore and stroke.

3—Name the fastest 1919 racing cars and state the events in which they participated; give mileage, make and horsepower of engine.

4—What is the bore and stroke of the Stutz racers and the 300-hp. Christie?—Julian Andersen, Elberon, Ia.

1—The Hudson racing cars were not of special construction, except that the wheelbase was shortened to 105 in., in order to provide better riding balance at the high speeds. The gear was increased also, but aside from this the cars are stock.

2—The only records we have of any Knight cars being in a race are the Porter-Knight cars. They were entered in the Indianapolis race but due to some trouble at the last minute these cars did not compete.

3—The greatest event of the year was the 500-mile Indianapolis race. Howard Wilcox won that with a Peugeot, at 85.95 m.p.h. Exact information on the horsepower of racing engines is never available but the bore and stroke of the four-cylinder engine used in the Peugeot was 3.6 by 6.7.

4—The Stutz racers have a bore and stroke of $3\frac{1}{8}$ by $6\frac{1}{2}$ and are four-cylinder. We suppose you have in mind the Christie car that was owned and driven by Barney Oldfield. We do not happen to have the bore and stroke of this machine but the original Christie was powered with a 4-cylinder vertical engine that formed the front of the machine.

EQUIPPING REGAL FOR SPEED

Q—Will a Master carbureter increase the speed of a Regal underslung fitted with Atwater-Kent ignition and geared 3.5 to 1?

2—What kind of piston rings would help in gaining more speed?

3—What test of gas should one use in racing, and what kind of oil should one use?—M. W. Zimmerman, St. Petersburg, Fla.

1—Fitting this car with a new carbureter of any type will undoubtedly improve the running qualities and increase the speed to a certain extent.

2—The installation of a patented type of ring will improve compression and probably aid in gaining more speed.

3—A high test gas is used as quick volatilization is a very essential quality for racing. The kind of oil used depends upon the construction of the engine but is always a very light oil.

SPEED OF CARS

Q—State the highest speed that can ordinarily be obtained from the following cars fitted out with standard equipment and tried out on a concrete road. Briscoe 1920, 45 m.p.h.; Oakland Six, 45 m.p.h.; Scripps Booth B-39, 45 m.p.h.; Stutz Bearcat, 80 m.p.h.; Paige Glenbrook, 55 m.p.h.; Hupmobile R, 55 m.p.h.; Mercer Raceout, 80 m.p.h.; Chevrolet F. B. 50, 45 m.p.h.; Buick K-6-44, 60 m.p.h.; Velie 34, 50 m.p.h.; Velie 48, 55 m.p.h.; Cole, 65 m.p.h.; Saxon, 40 m.p.h.; Olympian, ?? m.p.h.

2—What is the price of the 1920 Briscoe and Olympian?—Wallace M. Hicks, Amboy, Ill.

1—It is very difficult to state any definite speed that a car will attain due to the fact its speed depends upon the condition of the car, the way it is driven, the condition of the weather, and the road it is driven over. The m.p.h written after the name of each car in the above question gives the approximate speeds obtainable under average conditions.

2—The price of the 1920 Briscoe as given in January 29 issue of MOTOR AGE is $1,885 for the coupe and sedan. Prices of the Olympian are not available.

LOZIER 84

Q—When was the four-cylinder Lozier 84 built, what was the selling price, horsepower, and gear ratio on first, second, third and fourth speeds?

2—What should be the speed of this model if in good condition?—Frank Jaeger, Freeport, Ill.

1—The Lozier 84 was made in 1915, 1916, 1917 and 1918. This model sold at $2100. The S. A. E. horsepower rating is 28.90 and the final gear ratio is 3.93 to 1.

2—Under average conditions the speed of this car will be about 55 m.p.h.

NASH FRAME

Q—Publish diagram of the wooden frame for a 1919 five-passenger Nash car model 681.—K. E. Frenette, Duluth, Minn.

The 1919 Nash is not equipped with a wooden frame but a pressed steel one. The only cars using a wooden frame are the Holmes and the Franklin.

Rebuilding

REBUILDING A HUPMOBILE

Q—Would it be practical to convert a Hupmobile 32 into a speedster?—James E. King, Wichita, Kans.

Due to the fact that the Hupmobile 32 is a car of real quality it will make a very desirable roadster, but it will not develop great speed. The 1913 model will be a little faster than the 1914, this being due to the fact that the engine does not have to pull the generator and is somewhat lighter because of the absence of generator, starting motor and battery. You can tune up this car to to do about 55 m.p.h., but that will be about its limit.

You can use the same cowl and drop the steering post by making another bracket. Then you will be able to form some new sides and run these down to the bucket seats. This will do away with the necessity of placing on the back, a tank which will call for the use of a vacuum tank. As a matter of fact you can remove the back seat, put on a rear deck and tire carrier and have a pretty good little speedster. A rear deck for this car can be obtained from the Hupp Motor Car Corp., Detroit, Mich. It will be necessary to change the rear fenders, however. By making new fenders all around and dropping the headlights you will have a quite and up-to-date looking car. Fig. 17.

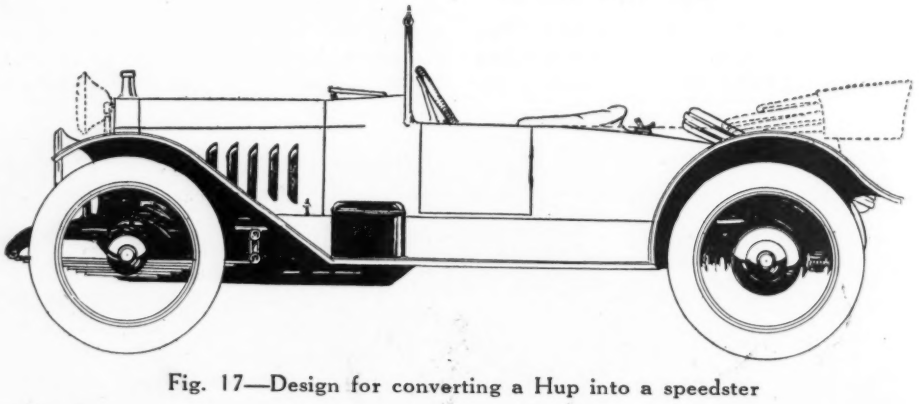


Fig. 17—Design for converting a Hup into a speedster

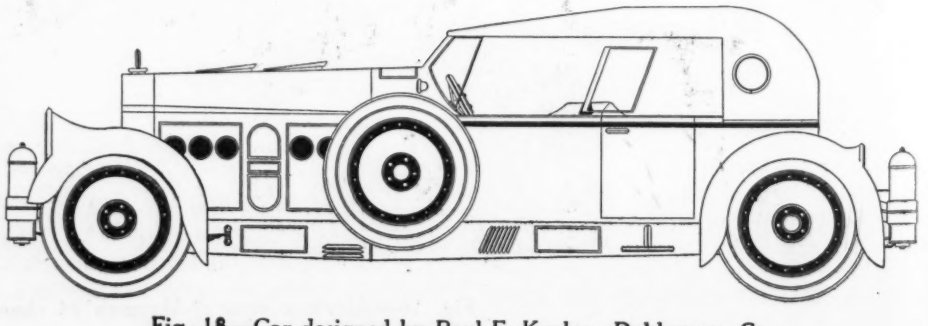
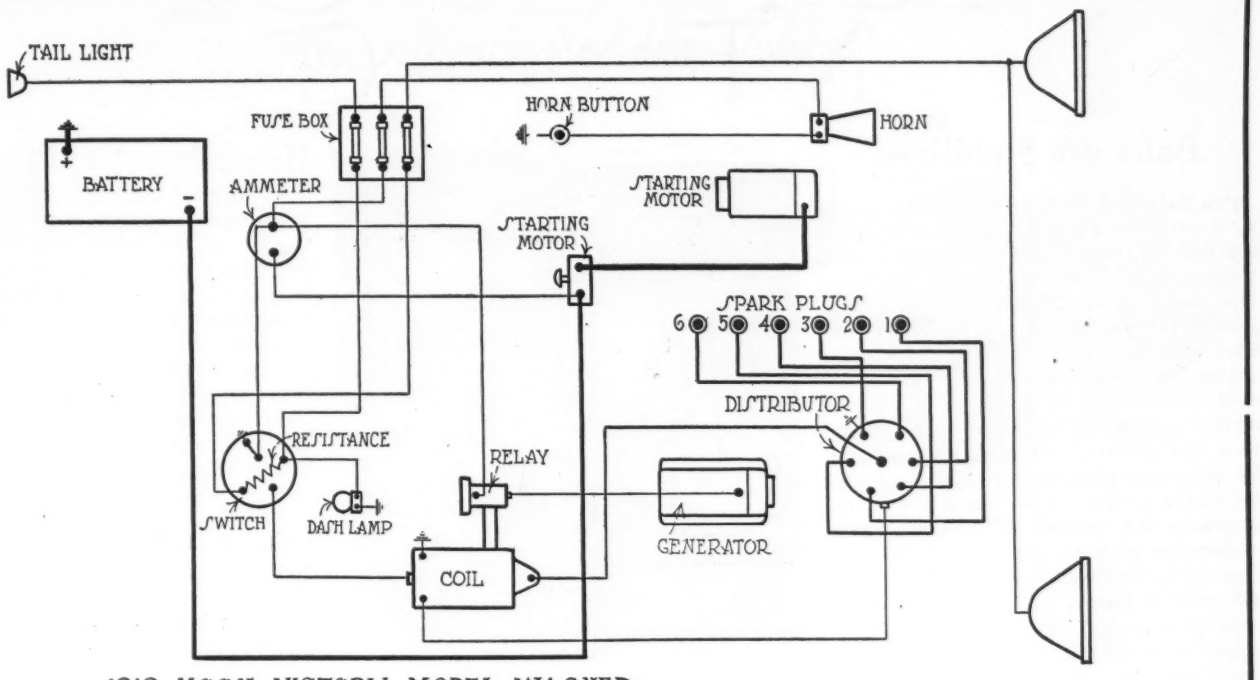
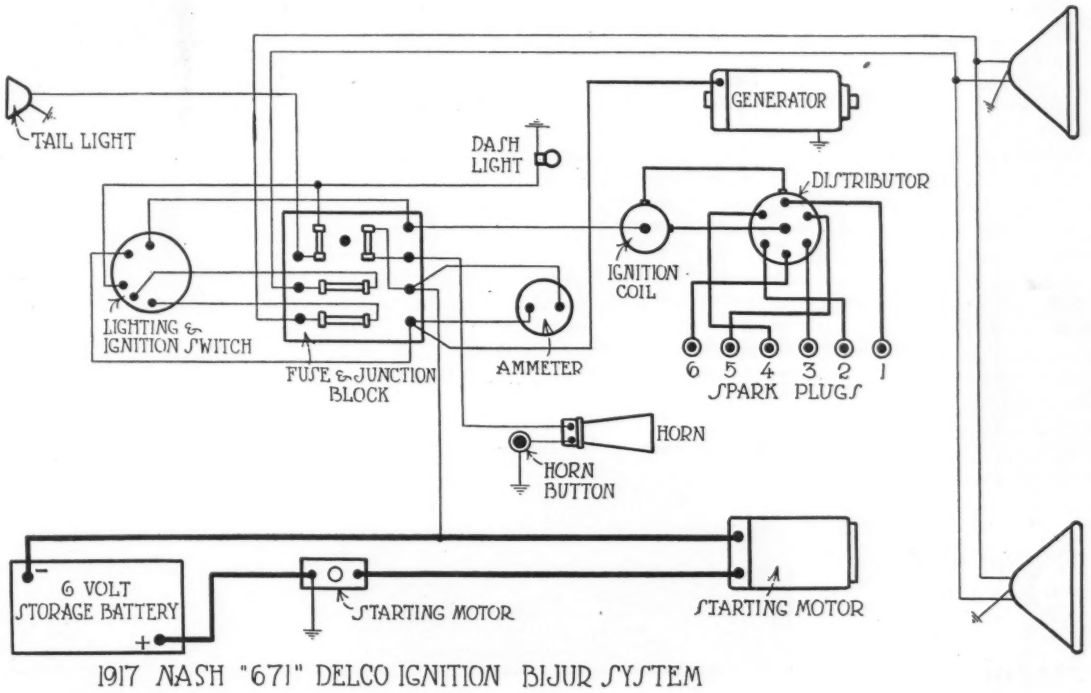


Fig. 18—Car designed by Paul F. Koeber, Dahlonega, Ga.

Motor Age Weekly Wiring Chart No. 68



1919 MOON VICTORY MODEL-WAGNER



1917 NASH "671" DELCO IGNITION BIJUR SYSTEM

THIS WEEK

1917—Nash 671

1919—Moon Victory Model

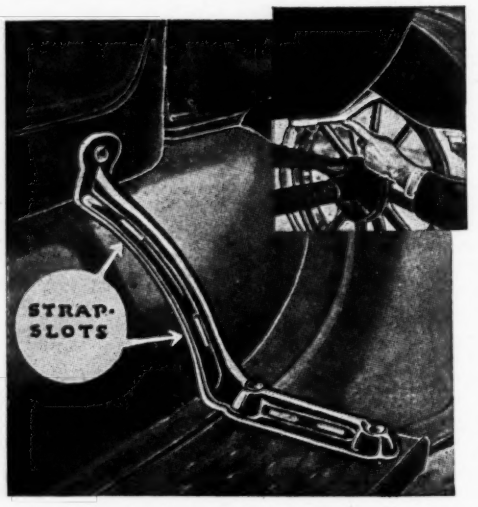
Allen—Dec. 18, '19
Auburn—Nov. 27, '19
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dorris—Dec. 11, '19
Empire—Oct. 30, '19
Essex—Oct. 23, '19
Ford—May 15, 22, '19
Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19
Mitchell—Jan. 8, '20
Monroe—Oct. 30, '19
Moon—Jan. 29, '20
Moore—March 4, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19
Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19; July 31, '19
Paige—July 3, '19
Paterson—June 26, '19; July 9, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Pilot—March 4, '20
Premier—Feb. 26, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Scripps-Booth—Jan. 15, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velie—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Willys-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

The Accessory Corner

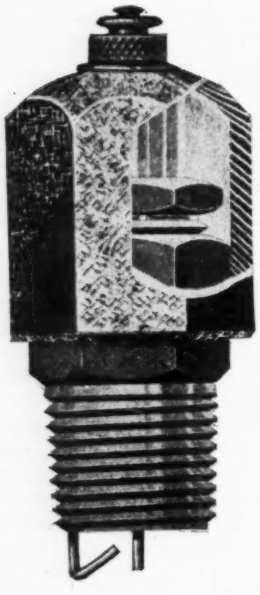
New Fitments for the Car

Balcrank Stabilizer

The Balcrank Stabilizer is a new steering device for Ford and other light cars put out by Cincinnati Ball Tread Co., Cincinnati, manufacturers of automotive parts. It is claimed that the device holds the front wheels in perfect alignment and does away with the wobbling motion characteristic of the wheels of most light cars. It is also supposed to prevent constant jarring and jolting from the steering wheel, thus relieving the arms and shoulders of the driver of the usual strain. This stabilizer is attached to the tie-rod on the front axle. A car can be equipped in a very short time with the use of a monkey-wrench and pair of pliers.



Bracefords for Ford running boards and fenders



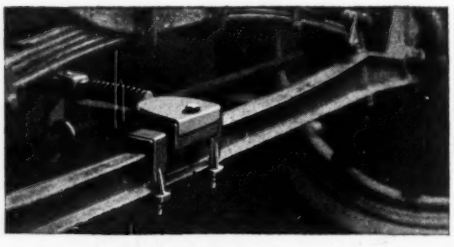
New spark plug cover called Protexun for protecting cores

Protexun Spark Plug Cover

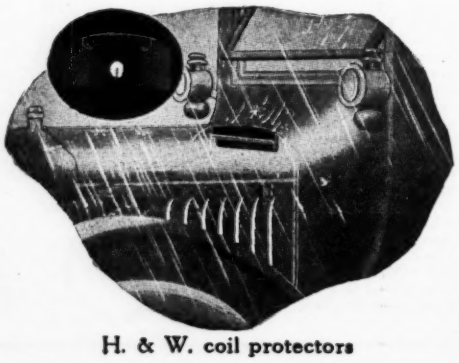
The Protexun is a new spark plug cover that will keep your spark plug cores out of the scrap heap. This cover protects spark plug cores from sudden changes in temperature as well as keeping them free from dirt and grease. Carbon accumulates excessively on cores that have insulating qualities affected. Covering them up will keep the insulating qualities unaffected and carbon trouble will be down to a minimum. The Protexun is manufactured by Irl R. Hicks, Centralia, Mo., and can be furnished for any size spark plug.

Presto Hose Clamp

Does your radiator hose leak? If it does it had probably rusted the bolt and nut and will require a lot of your time, perhaps some of your fingers and a lot of your temper before the new hose is in place. The Presto Hose Clamp manufactured by the Copper Clamp Co., Brooklyn, come with the bolt and nut already assembled, will go on snug and tight in a few seconds and need never to be taken apart. The clamps are made of specially tempered round wire flattened out, will withstand a tensile pull of 165 lb. and are rust-proof.



Balcrank stabilizer for Fords



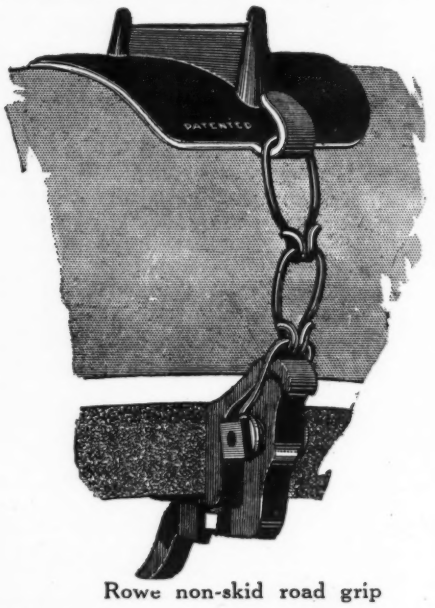
H. & W. coil protectors

Rowe Non-Skid Road Grip

In placing the ordinary tire chain on the wheel it is necessary to jack up the car or lay the chain down on the road and run onto it so as to enable you to clamp it on the wheel. The Road Grip manufactured by Wood Bros. Thresher Co., Des Moines, Ia., can be put on in a minute's time without any jacking up of the car and is said to serve the purpose as well as any chain. A set of eight grips to fit 3½-in. tires can be obtained for $8.

Bracefords

Bracefords are manufactured by the Prince Mfg. Co., Sumter, S. C., and sell for $4.25 per set of four. This brace stops fender-shake, fender-flapping, runboard sagging and noise. It has an added feature of holding the fenders up under heavy load and prevents smashing the entire side of the car in case of collision. This device ought to be of interest to the Ford owners as well as the dealer and service manager. The illustrations show the method of attaching to the front and rear fenders.



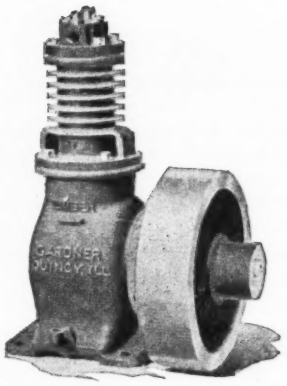
Rowe non-skid road grip

The H. and W. Coil Protectors

Ford owners have had a great deal of trouble during rainy weather from wet coils, causing a short-circuit in cutting out one or more cylinders from operation. The H. & W. coil protector distributed by the Kokomo Sales Service Co., Kokomo, Ind., eliminates all trouble due to coils getting wet. It is of very simple construction, fits over the dash under the hood and is entirely hidden from sight when installed.

Service Equipment

Time Savers of the Shop



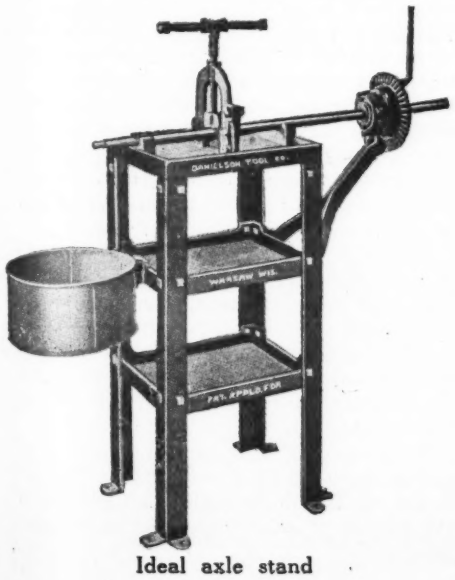
Gardner big capacity compressor

Gardner Air Pump

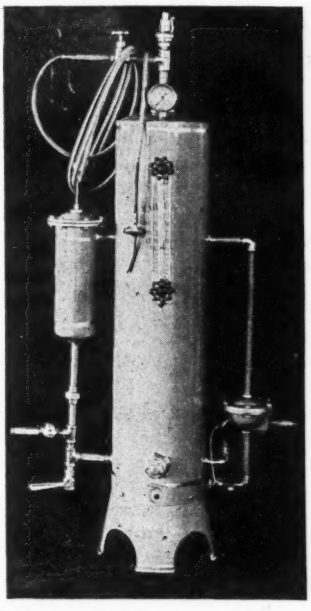
The Gardner Gee-Gee model air pump which is shown in the illustration is a big capacity compressor, made especially for garage use and to sell at a low price. It is of the inclosed air-cooled type. Lubrication is by splash. It is fitted with a carefully ground piston and piston ring. This pump is furnished as a pump only. A flywheel is equipped that allows it to be secured to any line or means for driving. The bore and stroke of this machine is 3 in. by 3 in.. At maximum speed 600 r.p.m. it has a capacity of 7.6 cu. ft. It will give a pressure as guaranteed by the manufacturer of 200 lb. This machine is made by the Gardner Governor Co., Quincy, Ill.

Duplex Grease Gun

A power driven grease gun actuated by a hand operated lever which forces a supply of grease through a flexible hose is just being introduced to the trade by the Friction Proof Lubricant Co., Des Moines, Ia. The machine has a capacity of 40 lb. of grease. The lever with which it is actuated creates enough pressure to allow the gun to operate with any kind of grease, hard or soft, or if need be oil. A rack and pinion attachment is fitted that allows the lever to be moved back and forth which actuates the plunger inside the pump. All moving connections on this pump are fitted with large sized glands that keep the grease from leaking out which would otherwise spoil the appearance of the machine.



Ideal axle stand



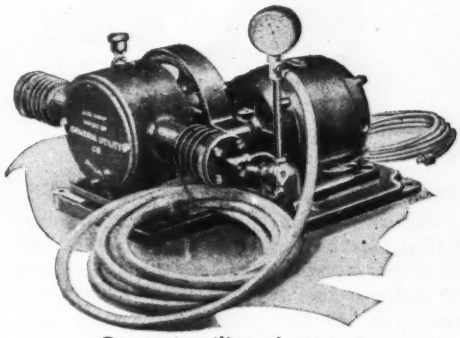
Lattner steam parts cleaner

Lattner Parts Cleaner

The Lattner steam parts cleaner which is shown herewith is designed for use in the service station for the purposes of eradicating dirt, grease and foreign material from the parts of the motor car machinery. The burner is for gas and is equipped with an automatic thermostatic device that shuts the flame off when the steam pressure rises to its maximum point. The water is also controlled automatically. A steam gage and safety valve is furnished with the machine. This device is made by P. M. Lattner Mfg. Co., Cedar Rapids, Ia. Equipped with parts mentioned above its price is $100.00.

Ideal Axle Stand

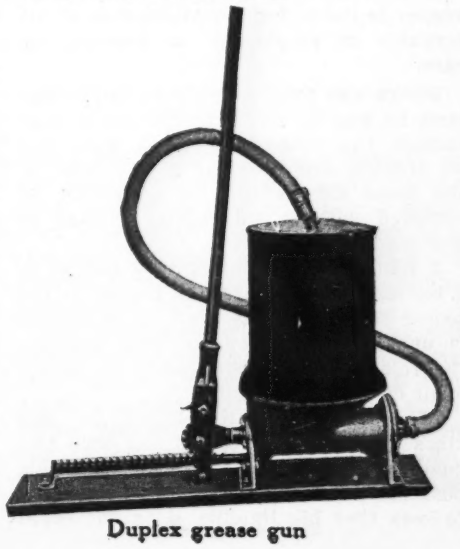
This is a stand made by the Danielson Tool Co., of Wausau, Wis., it is made especially for rear axle work. The stand takes up less than two square feet of floor space; three convenient trays for tools and nuts; has a detachable grease pan which catches and retains all grease coming from the differential case; has an absolute and positive fastening to the floor, giving rigidity which is so desirable in an axle stand; has a rapid and rigidly securing clamp for handling axles in any position. It is possible with this stand to have two, three or four men work on an axle at one time in an emergency case. The stand is constructed of steel and iron trays and is practically indestructible.



General utility air pump

General Utility Air Pump

The General utility air pump shown in the illustration is one that is driven directly from an electric motor and one that delivers air directly from the compressor to the motor car tire. Its capacity is 3 cu. ft. of air per min. One especially valuable feature in connection with this pump is that it is of the size that can be used for larger work if necessary operated in conjunction with a air reservoir. The pump is air-cooled and it is therefore not necessary to constantly furnish it with water for cooling purposes. The electric motor is furnished either in alternating current or direct current and 110 or 220 volts. This machine is made by the General Utility Co., Philadelphia.



Duplex grease gun

Law in Your Business

By Wellington Gustin

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

CASES OF INTEREST

PRINCIPLES TO REMEMBER

The garage being a very modern institution, the law applying is in something of an uncertain and chaotic state. Much of it is in the making. The courts are resorting to the rules and principles, well established, governing livery stables keepers, warehousemen, and the like. As for the work and repairs made on motor vehicles, the courts are using analgous cases of machinists, blacksmiths, and various kinds of repairmen, and applying the principles found therein. One legal writer has well said, "It speaks well for those engaged in the business and for the character of their patrons, that not many reported cases have appeared in the courts. However, the complexity of an enormous development in the motor world is rapidly making the field one of first importance in the law. The fundamental principles must remain the same and one who has a clear grasp of these will be able to solve the problems as they arise. With a knowledge of the principles one may know how to proceed in his business with certainty, decision and energy.

That the business of the garage is lawful has been held by judicial decisions. Some states control it by license and special statutes.

MAY A GARAGE BUILDING BE REMOVED FROM LEASED PREMISES?

WHAT IS THE LIABILITY OF GARAGE KEEPERS ON STORED CARS?

It is a general rule that the garage keeper is liable for the negligence of his servants or employees in driving his cars.

Where one puts up a garage on leased land he has the right to remove it even though the lease agreement does not so provide, and even after the term of the lease has expired, if same can be removed without substantial damage to the land.

A motor vehicle stored in a garage is a bailment and the garage keeper is the bailee for hire. The kind of bailments is one for the benefit of both parties, the relation being established by agreement of the parties.

"The liability of the bailee in this class of bailments, is for the care and custody of the property placed in his possession and control, it therefore follows that his liability does not begin until he has the possession and control of the property, and continues until the possession and control of is surrendered to the bailor, or his order or assigns, or to the rightful owner."

The garage keeper has no title to the property except a title limited to the right of possession, given him by the owner, and his right to this possession ceases whenever he is guilty of fraud or bad faith, or any misuse of the property. But this possessory title in the garage keeper is paramount to any claim except as to the title of the owner, and during the lawful existence of the bailment contract, even the owners cannot disturb the possession, custody and use to the extent given in the contract to the garageman. And it might be added that his possession may not be disturbed where it is necessary to protect the property from loss and damage.

WHAT KIND OF TITLE DOES HE POSSESS IN THE PROPERTY?

IS HE AN INSURER OF THE CARS?

Since the garageman's possessory title is equivalent to actual ownership as against every one but the owner he can bring suit for damages to a car stored with him. However, should the car be stolen from his possession does not render him the owner for the purpose of alleging ownership in a criminal complaint for larceny.

Being bailees for hire, garage keepers are required to take the same care of automobiles intrusted to them that men do of their own property. In one case the keeper was liable for his failure to protect the upholstery in a car from moths.

The garage keeper is not an insurer of the cars and property intrusted to his care. Where such cars in one's garage is destroyed say by a fire, the keepers' liability is predicated upon whether he was negligent in the matter. In such cases ordinary care is all that is required, that is the care that one would take were the property his own.

In no sense is he an insurer.

Editor Motor Age—As Louisiana is going very extensively into road-building, with metal surface, we desire to introduce a bill, when the legislature meets, to prohibit the use of tractors with iron lugs on wheels, on such roads. Won't MOTOR AGE please secure for me, or tell me where I can procure it, a copy of such a law for reference? Please state also how many states have enacted laws prohibiting the use of tractors with iron lugs, on their hard-surfaced roads.—J. T. Bringier, M. D., Burnside, La.

An examination of the laws of several of the states most likely to have such statutes show that the subject is new to the legislatures. Michigan, Indiana and Iowa merely regulate the size, weight and tires of trucks using certain roads, of which the law of Indiana is typical. On page 1371, sec. 161, Compiled Statutes of New Jersey, First Supplement, (1911-1915) a provision reads:

"When used on a State Highway, no motor vehicle tire shall be fitted with any blocks, hobs, studs or other projections, and no wheels shall be locked so as not to revolve."

Illinois recently voted $60,000,000 in bonds for good roads and at the last session of the Illinois legislature, the Motor Vehicle Act was passed which goes into the problem you present quite thoroughly. Among other provisions, section 4, of the act says, "No metal tired vehicle, including tractors, tractor engines and other similar vehicles, shall be operated over any improved public highways of this State, if such vehicle has on the periphery of any of the road wheels any block, stud, flange, cleat, ridge, bolt, lug, or any projection of metal or wood which projects radially beyond the tread or traffic surface of the tire," etc.

The Illinois Motor Vehicle Act, as approved June 30, 1919, has other provisions regarding tractors, trucks, trailers and other vehicles likely to injure or destroy good roads. You may secure a copy of this act no doubt by addressing L. L. Emmerson, Secretary of State, Springfield, Ill.

We have no data as to how many states have adopted such laws, but no doubt such will be rapidly adopted with the advent of good roads and more tractors.

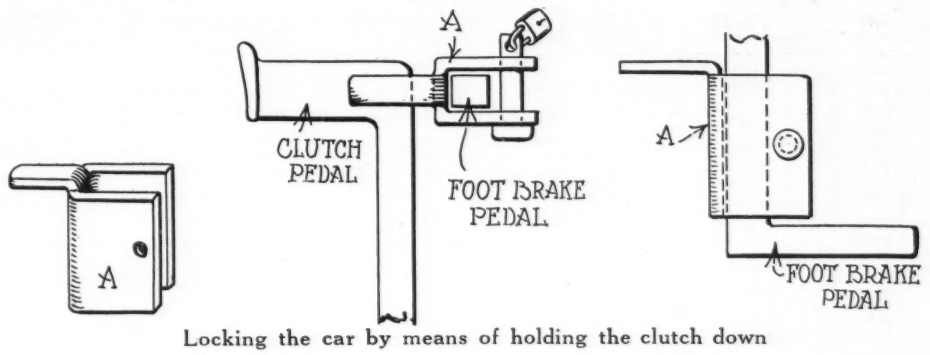
The Automotive Repair Shop

Practical Maintenance Hints

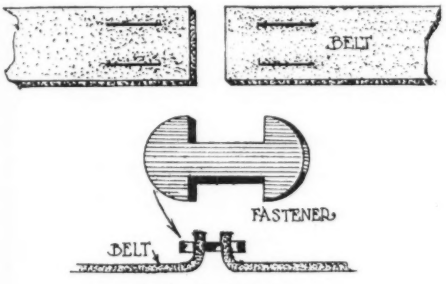
Automobile Lock

Drawing shows a handy car lock for the clutch which holds clutch out by means of a shaped iron device being slipped over the foot brake and locked with padlock while a protruding arm holds the clutch up—disconnecting the engine from the car.

When in position, the brake pedal remains down and the clutch is pushed up and held by device, the strain coming against the brake pedal. When removing locking device, push upward on clutch to release device and take off the lock.



Locking the car by means of holding the clutch down



Belt connector

Easy Method of Securing Foundation Bolts

When setting up a new machine on a concrete shop floor one is sometimes puzzled as to the easiest and best method to secure the machine base bolts. The sketches show how the work may be done satisfactorily, using lag screws in place of bolts.

First drill with a rock drill a taper hole as shown, then pour this hole nearly full of lead and drill two different size holes in this lead lining, each smaller than the diameter of the lag screw at the section. Then screw in the lag bolt as illustrated. It will cut its own threads in the lead. To prevent it turning or loosening use a lock washer under the head.

Belt Connections

In the August 28, 1919 issue, L. D. Yager offered a suggestion for overcoming the noisy click of a fan felt fastener.

I think I can go him one better. In illustration is shown a belt fastener I ran onto in an obsolete machine on a small island owned by an English steamboat company. As I have never seen it advertised or used in the United States believe it is of English origin. It is made in a number of sizes and some of them are quite large. I saw a number of broken belts hanging on the wall, but none of them had given away at the fastener. Where quick belt changes are necessary I do not believe this idea could be beaten.—L. H. Orewiler.

Metal Covered Benches

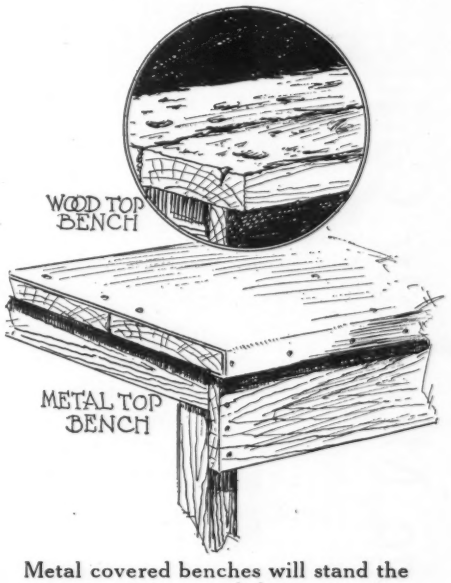
Metal covered benches stand the wear and tear better and are easier to keep clean than wood topped benches. For light work, galvanized sheet iron such as may be purchased from a tinsmith may be used but for heavier work material about ⅛ in. thick is advisable. Such a surface will withstand the abuse incident to rapid, efficient shop work much better than wood will. It will not dent so easily, will not splinter, does not collect nor hold dirt and is easy to clean.

Safety Cleaning Pot

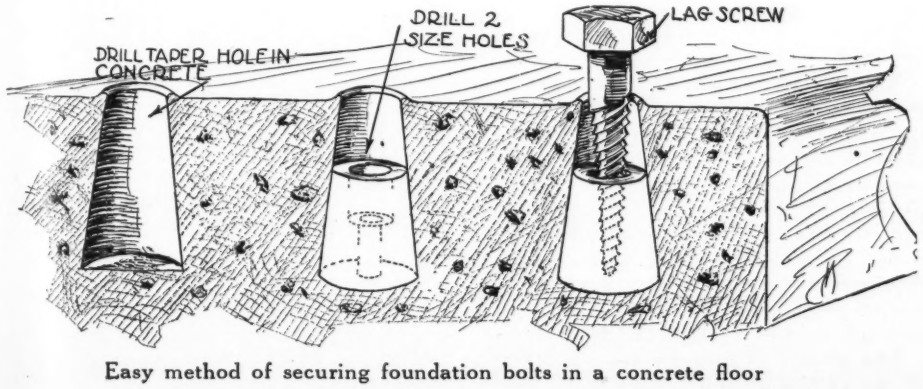
Good workmanship in the shop demands clean parts. When a unit is being assembled after overhaul, every working part must be scrupulously clean if the most is to be expected in the way of long life and uninterrupted performance.

To this end the Cadillac service station in Detroit have cleaning pots filled with kerosene within easy reach of every workman. There are several on the benches and several more on the floor so that no matter where a workman is or what he is doing there is a cleaning pot right at hand. This, of course, is a splendid aid in obtaining clean parts for assembly.

The pots themselves are a special safety design and when not in use are kept closed. They are made of cast aluminum with a heavy hinged cover which fits into a groove in the pot in such a way that it is securely sealed. The pots vary in size from about 1½ to 3 gal.



Metal covered benches will stand the wear much better



Easy method of securing foundation bolts in a concrete floor

Motor Age Monthly Guide to Truck Specifications

These tables are revised and brought up to date monthly

Name and Model	Tons apacity	Chassis Price	Front Tires	Rear Tires	Nam of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
A. & B. 3T	3	.....	48x3½d	48x3½d	Own	4–5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
A. & B. 5T	5	.....	48x3½d	48x5d	Own	4–5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
Acason R	1	.....	36x3½	36x5	Wauk.	4–3½x5¼	Eise.	.....	Wauk.	Scheb.	Fuller	Fuller	worm	Timkn.	Ross
Acason RB	1½	.....	36x3½	36x5	Wauk.	4–3½x5¼	Eise.	.....	Wauk.	Scheb.	Fuller	Fuller	worm	Timkn.	Ross
Acason H	2½	.....	36x4	36x7	Wauk.	4–3½x5¼	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason L	3½	.....	36x5	40x5d	Wauk.	4–4¼x6½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason M	5	.....	36x6	40x6d	Wauk.	4–4¼x6½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason Tractor	6	.....	36x4	36x7	Wauk.	4–4¼x5½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason Tractor	10	.....	36x5	40x5d	Wauk.	4–4¼x6½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Ace	1½	.....	34x3½	34x5	Buda	4–4½x5¼	A-K	West.	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Ace	2½	.....	36x4	36x7	Buda	4–4¼x5½	A-K	West.	Pierce	Scheb.	M.&E.	Cotta	worm	Timkn.	Ross
Acme B	1	$2,075	34x3½	4 05	Cont.	4–3½x5	Eise.	G&D	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme F	1½	2 275	34x3½	34x5	Cont.	4–3½x5	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme A	2	2 875	36x4	36x7	Cont.	4–4¼x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme C	3½	3 875	36x5	40x5d	Cont.	4–4½x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme E	5	4,975	36x6	40x6d	Cont.	4–4½x6	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Air-O-Flex C	1½	.....	36x3½	36x5	Buda	4–3½x5¼	Wag.	.....	Cont.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
All-American AA	1	1,495	33x4*	32x4	H-S	4–3½x5	Simms	none	Pharo	Strom.	B.&B.	B-Lipe	in-g.	Russel	Ross
All-Power SV4	3½	4,800	36x6	36x10	.....	4–4½x5½	Eise.	West.	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Ross
Apex C	1	1,395	33x4	32x3½	Buda	4–3½x5½	A-L	A-L	Pharo	Zenith	Det.	Cotta	worm	Timkn.	Ross
Apex D	1½	1,595	32x3½	32x4	Buda	4–3½x5½	A-L	A-L	none	Strom.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Apex E	2½	2,450	36x4	36x6	Buda	4–4½x5½	Eise.	Eise.	Duplx.	Strom.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Armleder HW	2½	.....	36x4	36x4d	Cont.	4–4½x5½	Bosch	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder KW	3½	.....	36x5	36x5d	Cont.	4–4½x5½	Bosch	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Atco IG-10	1	.....	34x4½	36x6	.....	4–3½x5¼	.....	West.	.....	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Atlas	¾	.....	.....	.....	.....	3½x5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atterbury 7CX	2½	3,175	36x4	36x4d	Cont.	4–4½x5½	Eise.	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury 7D	3½	3,975	36x5	40x5d	Cont.	4–4½x5½	Eise.	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury 8E	5	5,475	36x5	40x6d	Cont.	4–4½x6	Eise.	Delco	Cont.	Zenith*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Autocar 21UF	2	2 300	34x4	34x5	Own	2–4½x4½	Bosch	none	none	Strom.	Own	Own	d-rd.	Own	Own
Autocar UG21	2	2 400	34x4	34x5	Own	2–4½x4½	Bosch	none	none	Strom.	Own	Own	d-rd.	Own	Own
Available H-2½	2½	3,250	36x4	36x8	Cont.	4–4¾x5¼	.....	.....	none	Strom.	Own	Own	d-rd.	Own	Own
Available H-3	3	4 200	36x5	40x5d	Cont.	4–4½x5½	.....	.....	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Opt.	Opt.
Available H-5	5	5,575	36x6	40x6d	Cont.	4–4½x6	.....	.....	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Opt.	Ross
										Cont.	Zenith	B-Lipe	B-Lipe	worm	Opt.	Ross
Beck 1-ton	1	1,550	34x3	34x3	Cont.	4–3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
Beck A	1½	1,750	34x3½	34x5	Cont.	4–3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
Beck B	1½	1,950	34x3½	34x6	Cont.	4–3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
	2														
Beck C	2	2,350	36x4	36x7	Cont.	4–4¼x5¼	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
	2½														
Beck D	3	3,700	36x5	36x5d	Cont.	4–4½x5½	Bosch	.....	.....	.....	.....	.....	in-g.	Clark	Lavn.
	3½														
Bell	1½	.....	32x3½	32x4	Buda	4–3½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	.....	worm	Shel.	Lavn.
Bell O	2½	.....	34x4	34x6	Buda	4–4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	.....	.....	Russel	.....
Belmont AA	¾	1,150	31x4	31x4	.....	4–3½x5	Conn.	Dyn.	Pierce	Zenith	G-Lees	G-Lees	in-g.	Russel	Gem.
Belmont BB	1½	1,950	34x4½	36x5	Cont.	4–3½x5¼	Eise.	Dyn.	Pierce	Zenith	G-Lees	G-Lees	in-g.	Clark	Lavn.
Bessemer G	1	1,600	34x3	34x4	Cont.	4–3½x5	Bosch	Opt.	none	Ray.	Fuller	Fuller	in-g.	Clark	Lavn.
Bessemer H-2	1½	2,085	36x3½	36x5	Cont.	4–3½x5	Bosch	Opt.	Pierce	Ray.	B.&B.	.....	in-g.	Torbn.	Ross
Bessemer J-2	2½	2,785	36x4	36x4d	Cont.	4–4¼x5½	Bosch	Opt.	Pierce	Ray.	B.&B.	.....	in-g.	Torbn.	Ross
Bessemer K-2	4	4,285	36x5	36x10	Cont.	4–4½x5½	Bosch	Opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem K	¾	1,495	34x4½	35x5	Own	4–3½x5	Bosch	G&D	none	Strom.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem DG	1½	2,095	34x3½	34x5	Own	4–4x5½	A-K	G&D	Pierce	Strom.	B.&B.	Det.	in-g.	Stan-P	Ross
Bethlehem EH	2½	2,495	34x4	34x6	Own	4–4x5½	A-K	G&D	Pierce	Strom.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem FJ	3½	3,595	34x4	34x5d	Own	4–4½x5½	A-K	G&D	Pierce	Strom.	B.&B.	Det.	in-g.	Russel	Lavn.
Betz	2½	2,700	36x4	36x7	Buda	4–4¼x5½	Bosch	none	Pierce	Strom.	B.&B.	Det.	in-g.	Russel	Lavn.
Bollstrom A	5	.....	36x6	36x6	Own	4–4¼x5½	Bosch	none	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Brinton H	1	1,500	33x4½*	33x4½*	Wis.	4–3½x5	.....	.....	none	.....	.....	Own	in-g.	Own	Gem.
Brinton F	2½	3,400	36x4	36x7	Cont.	4–4½x5¼	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Briscoe T-34	1	.....	33x4*	34x4	Own	4–3⅜x5	Conn.	A-L*	Own	Buick	Own	Own	in-g.	Russel	Lavn.
Brockway S-2	1½	2,100	36x3½	36x5	Cont.	4–3½x5	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Shel.	Gem.
Brockway K-4	2½	3 000	36x4	36x7	Cont.	4–4¼x5½	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway R-2	3½	3,900	36x5	36x5d	Cont.	4–4½x5½	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway T	5	5 000	36x5	40x6d	Cont.	4–4¾x6	Eise.	.....	Duplx.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Douglas C	1	1,790	34x4½	35x5	Buda	4–3½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	in-g.	Torbn.	Ross
Douglas D	1½	2,175	35x5	36x6	Buda	4–4½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	in-g.	Torbn.	Ross
Douglas E	2½	2,750	36x6	40x8	Buda	4–4½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	in-g.	Torbn.	Ross
Douglas F	2½	3,025	36x6	40x8	Buda	4–4½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	worm	Wis.	Ross
Duplex Limited A	1½	2,575	35x5	38x7	Hink.	4–4x5¼	West.	West.	.....	Strom.	Covert	Covert	worm	Shel.	Ross
Economy T-LHD	¾	1,250	35x5	35x5	Own	4–3½x5½	A-L	A-L	none	none	Zenith	Warner	in-g.	Torbn.	Jacox
Elmira C	½	.....	29x3	2 x3	Perk.	4–3¼x4	A-K	Carl.	none	Holl.*	Own	Own	bevel	Own	Own
Ellsworth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Erie	1½	.....	34x3½	36x5	Buda	4–3¾x5	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	2	.....	34x3½	36x5	Buda	4–4½x5½	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	2½	.....	34x4	36x5	Buda	4–4½x5½	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	3½	.....	36x5	40x5d	Buda	4–4½x5½	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Fageol	1½	.....	34x3½	34x6	Lyc.	4–3½x5	Dixie	opt.	none	Tillot.	B.&B.	Own	worm	Stand.	Ross
Fageol	2½	3,400	34x4	36x7	Wauk.	4–4½x5½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Fageol	3½	4 500	36x5	36x5d	Wauk.	4–4½x6½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Fageol	5	5,300	36x6	40x6d	Wauk.	4–4½x6½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Famous B-10	1	.....	36x3½	36x4	Cont.	4–3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Famous B-12	1½	.....	36x3½	36x5	Cont.	4–3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Fargo P	2	2,200	36x4	36x6	Cont.	4–3½x5	Bosch	none	Mon.	Ray.	Fuller	Fuller	in-g.	Russel	Jacox
Federal SD	1	2 500	35x5*	36x6*	Cont.	4–3½x5	Eise.	A-L	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal TE	1½	2,500	36x3½	36x5	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal UE	2	2,500	36x4	36x7	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal Trac	3	2 800	36x4	36x7	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal WD	3½	3,650	36x5	36x5d	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal XC	5	4 500	36x6	40x6d	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal Trac	7	3,825	36x5	36x5d	Cont.	4–4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Ford TT	1	550	30x3½*	32x4½*	Own	4–3¾x4	Own	.....	.....	opt.	Own	Own	worm	Own	Own
Forschler	1	2 100	36x3	36x4	Cont.	4–3½x5	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1½	2 375	36x3½	36x5	Cont.	4–3½x5	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	2	2 750	36x4	36x7	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	3	3 450	36x4	36x8	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
F. W. D. B	3	4 500	36x6	36x6	Wis.	4–4½x5½	Eise.	.....	Pierce	Strom.	M.&E.	Cotta	bevel	Own	Ross
Fulton FX	1½	1.850	34x3½	34x5	H-S	4–3⅜x5 1/16	Simms	.....	.....	Carter	B.&B.	Own	in-g.	Russel	Lavn.
Fulton C	2	2,350	34x4	34x6	H-S	4–3½x5	Simms	.....	.....	Carter	B.&B.	.....	in-g.	Russel	Lavn.
Gabriel C	1	2 000	35x5	35x5	Buda	4–4½x5½	Bosch	L-N	none	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel E	2	3 250	36x4*	36x7*	Buda	4–4¼x5½	Bosch	L-N	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel F	4	4 300	36x5	40x6d*	Buda	4–4½x6	Bosch	L-N	Duplx.	Ray.	B.&B	B-Lipe	worm	Timkn.	Gem.
Garford 25	1½	2,090	36x3½	36x4	Buda	4–3½x5½	.....	West.	Mon.	Strom.	B-Lipe	Own	worm	Timkn.	Ross
Garford 70-H	2	3.190	36x4	36x7	Buda	4–4¼x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford 77-C	3½	4.300	36x5	40x5	.....	4–4½x5½	.....	.....	.....	.....	.....	.....	.....	.....	.....
Garford 68	5	5.000	36x5	40x6d	Wis.	4–4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford 69	6	5,000	36x5	40x7d	Wis.	4–5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Gary F	1	2,100	36x3½	36x4	Buda	4–3¾x5	Eise.	.....	McCan.	Master	Fuller	Fuller	worm	Timkn.	Lavn.
Gary GT	1½	2,550	36x3½	36x5	Buda	4–4x5½	Eise.	.....	McCan.	Master	Fuller	Fuller	worm	Timkn.	Ross
Gary J	2½	2,950	36x4	36x7	Buda	4–4¼x5½	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gary KT	3½	3,950	36x5	40x5d	Buda	4–4½x6	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gary M	5	5,050	36x6	40x6d	Buda	4–5x6½	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gersix M	1½	2 850	36x3½	36x6	Buda	4–4x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Gersix K	2½	3.350	36x4	36x7	Buda	4–4¼x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Gersix L	3½	4,350	36x5	40x5d	Buda	4–4½x6	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Giant 15	1	1,950	34x3½	34x5	Cont.	4–3¾x5	Eise.	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Jacx.
Giant 14	1½	2.375	34x3½	34x5	Cont.	4–3¾x5	Eise.	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Jacx.
Giant 16	2	2.850	36x4	36x7	Cont.	4–4½x5½	Eise.	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Ross
Giant 17	3½	3,850	36x5	36x5d	Cont.	4–4½x5½	Eise.	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Jacx.
G. M. C. 16	¾	.....	35x5*	35x5*	Cont.	4–3½x5	Eise.	.....	Mon.	Marvel	Own	Own	bevel	.....	Jacx.
G. M. C. 31	1½	.....	36x3½	36x5	Cont.	4–3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 41	2	.....	36x4	36x7	Cont.	4–4¼x5¼	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 71	3½	.....	36x5	40x5d	Cont.	4–4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 101	5	.....	36x6	40x6d	Cont.	4–4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
Graham A	1½	2,295	35x5	36x6	Cont.	4–3½x4	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Torbn.	Lavn.

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles., Ruggles. **Carburetor**—Scheb., Schebler; Strom. Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Bork & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wo., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Champion	3-5	1,000	32x4	32x4	Light	4-3¼x4½	A-K	.....	none	.....	.....	.....	bevel	.....	.....
Chevrolet T	1	.....	33x4	35x5*	Own	4-3½x5½	Remy	A-L*	Mon.	Zenith	Own	Warner	worm	Ind.	Warn.
Clydesdale	1	.....	34x3½	34x5	Cont.	4-3¾x5	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	S.P.	Ross
Clydesdale 42	1½	2,445	36x3½	36x6	Cont.	4-3¾x5	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 65X	2½	3,200	36x4	36x8	Cont.	4-4¼x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 90	3½	4,075	36x5	40x10	Cont.	4-4¼x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 120B	5	5,025	36x6	40x12	Cont.	4-4¾x6	Bosch	.....	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Collier 18	1	.....	34x4	34x5	Cont.	4-3¾x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chcgo.	Ross
Collier 19	1½	.....	36x6	36x6	Cont.	4-3¾x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chcgo.	Ross
Collier 20	2	.....	36x4	36x7	Cont.	4-4¼x5½	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chcgo.	Ross
Columbia F	1	1,750	34x3½	34x4	Cont.	4-3¾x5	Dixie	.....	Pierce	Shake.	B.&B.	Covert	in-g.	Russel	Own
Columbia H	1½	2,200	34x3½	34x5	Hink.	4-3¾x5½	Bosch	.....	Hink.	Strom.	Det.	Covert	in-g.	Russel	.....
Columbia G	2½	2,750	36x4	36x7	Hink.	4-4 x5¼	Bosch	Remy	Hink.	Strom.	Det.	Covert	in-g.	Russel	Own
Comet	1½	1,950	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	.....	Carter	B.&B.	Muncie	worm	Chcgo.	C.A.S.
Commerce E	1	1,590	34x3	34x4	Cont.	4-3¾x5	Eise.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Jacox
Commerce EP	2	1,965	36x6	36x6	Cont.	4-3¾x5	Eise.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Own
Concord A	1½	2,350	36x3½	36x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Concord B	2½	2,850	36x4	36x4d	Buda	4-4¼x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Conestoga 12	¾	.....	32x4½	32x4½	Cont.	4-3½x5	Simms	.....	.....	Strom.	B.&B.	Muncie	in-g.	Torbn.	C.A.S.
Conestoga 20	1	2,100	34x3½	34x5	Cont.	4-3½x5	Simms	.....	.....	Strom.	Fuller	Fuller	worm	Wis.	Ross
Conestoga 30	2	2,700	36x4	36x4d	Cont.	4-3¾x5	Simms	.....	Dplx.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Corbitt E	1	2,200	34x3½	34x4	Cont.	4-3¾x5	Eise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Corbitt D	1½	2,600	36x3½	36x5	Cont.	4-3¾x5	Eise.	Disco.*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt C	2	3,250	36x4	36x7	Cont.	4-4¼x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt B	2½	3,500	36x4	36x7	Cont.	4-4¼x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt A	3½	4,200	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	H-Shaw	Cotta	worm	Shel.	Ross
Corbitt AA	5	5,000	36x6	40x6d	Cont.	4-4½x6	Eise.	none	Pierce	Strom.	H-Shaw	Cotta	worm	Shel.	Ross
Dart H	1	2,100	34x3½	34x5	Buda	4-3¾x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart S	1½	2,250	34x3½	34x6	Buda	4-3¾x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart M	2½	3,000	36x4	36x7	Buda	4-4¼x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart W	3½	4,000	36x5	36x10	Buda	4-4½x6	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Day-Elder A	1	1,925	34x3	34x4	Cont.	4-3¾x5	Eise.	.....	.....	Zenith	Covert	Covert	worm	Shel.	Ross
Day-Elder B	1½	2,200	34x3½	34x5	Cont.	4-3¾x5	Eise.	.....	.....	Zenith	Covert	Covert	worm	Shel.	Ross
Day-Elder D	2	2,600	36x4	36x7	Cont.	4-4¼x5½	Eise.	.....	Mon.	Zenith	Covert	Covert	worm	Shel.	Ross
Day-Elder C	2½	2,850	36x4	36x7	Buda	4-4¼x5½	Eise.	.....	Mon.	Zenith	Covert	Covert	worm	Shel.	Ross
Day-Elder E	5	4,500	36x5	40x6d	Buda	4-4½x6	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Day-Elder F	3½	3,550	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Dearborn, F	1½	1,980	34x4	34x5	Cont.	4-3½x5	Bosch	.....	.....	Strom.	Fuller	Fuller	worm	Stand.	Lavn.
Dearborn, 48	2	2,390	34x4½	34x7	Buda	4-3¾x5½	Bosch	.....	.....	Strom.	Fuller	Fuller	worm	Stand.	Det.
Defiance, D	1½	.....	35x5	36x6	Cont.	4-3¾x5	.....	.....	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	.....
Defiance, E	2	.....	35x5	38x7	Cont.	4-3¾x5	.....	.....	none	Strom.	B.&B	G-Lees	in-g.	Torbn.	Own
DeKalb, E-2	2	2,100	34x3½	36x5	Cont.	4-4¼x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	Ross
DeKalb, E-2½	2½	2,600	36x4	36x6	Cont.	4-4¼x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	Ross
Denby, 12	1	1,950	35x5	36x6	Cont.	4-3½x5	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Ross
Denby, 134	2	2,450	36x3½	36x6	Cont.	4-3¾x5	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Denby, 25	3	3,250	36x4	36x7	Cont.	4-4¼x5½	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Denby, 27	4	4,150	36x5	36x10	Cont.	4-4½x5½	Eise.	.....	Simplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 210	5	4,900	36x6	40x12	Cont.	4-4½x5½	Eise.	Simp.	none	Simp.	Strom.	Warner	in-g.	Clark	Ross
Dependable	1½	2,150	34x3½	34x5	Buda	4-3¾x5½	Dixie	.....	Pierce	Strom.	Fuller	Fuller	worm	Wis.	Ross
Dependable	2½	2,750	36x4	36x7	Buda	4-4¼x5½	Dixie	.....	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
Diamond-T	1½	2,220	36x3½	36x5	.....	4-3¾x5½	Bosch	.....	.....	Strom.	.....	.....	worm	.....	.....
Diamond-T, FS	1½	2,445	36x3½	36x5	.....	4-3¾x5½	Bosch	.....	.....	Strom.	.....	.....	worm	.....	.....
Diamond T, J4	1½	2,755	36x3½	36x5	Cont.	4-3¾x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	.....	.....
Diamond T, J3	2	3,185	36x4	36x7	Cont.	4-4¼x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	.....	.....
Diamond T, LB	3½	4,390	36x5	36x5d	Cont.	4-4¼x5½	Bosch	.....	Pierce	Strom	B-Lipe	B-Lipe	worm	.....	.....
Diamond-T, R	5	5,190	36x6	40x6d	Cont.	4-4¼x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	.....	.....
Diamond-T, S	5	5,660	36x6	40x6d	Own	4-4¼x6	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	.....	.....
Diehl, A	1	1,575	34x4½	35x5	Cont.	4-3½x5	Bosch	Presto	none	Zenith	B.&B.	Durstn.	in-g.	Torbn.	Jacox.
Doane	2	3,750	36x5	36x7	Wauk.	4-4½x5½	Bosch	.....	.....	Master	B-Lipe	B-Lipe	Chain	Own	Own
Doane	6	5,825	36x6	40x6d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Master	B-Lipe	.....	Chain	Own	Lavn.
Dodge	¾	.....	32x3½	32x3½	Own	4-3¼x4½	Own	N.E.	none	Stew.	Own	Own	.....	Own	Own
Dorris, K4	2	3,285	36x4	36x7	Own	4-4½x5½	Bosch	West.*	Own	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Ross
Dorris K7	3	4,200	36x5	36x10	Own	4-4½x5½	Bosch	West.*	Own	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Ross
Gramm-Bernstein 15	1½	.....	36x3½	36x5	Cont.	4-3¾x5	N. E.	N. E.	.....	Strom.	Fuller	Fuller	worm	Clark	Ross
Gramm-Bernstein 65	1½	.....	36x3½	36x5	Cont.	4-3¾x5	N. E.	N. E.	.....	Strom.	Own	Own	.....	Stan-P	Ross
Gramm-Bernstein 20	2	.....	36x4	36x7	Cont.	4-4¼x5¼	N. E.	N. E.	Pierce	Strom.	Fuller	Own	worm	Shel.	Ross
Gramm-Bernstein 25	2½	.....	36x4	36x4	Hink.	4-4¼x5½	Eise.	N. E.	Pierce	Strom.	Own	Own	.....	Stan-P	Ross
Gramm-Bernstein 35	3½	.....	36x5	40x5d	Hink.	4-4¼x5½	Eise.	N. E.	Hink.	Strom.	Own	Own	.....	Stan-P	Ross
Gramm-Bernstien 50	5	.....	36x6	40x6d	Cont.	4-4½x6	Eise.	N. E.	Hink.	Strom.	Own	Own	.....	Stan-P	Ross
Grant 10	1½	1,885	34x4½*	34x5	Cont.	4-3½x5	Split.	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant 11	1½	1,935	34x4½*	34x5	Cont.	4-3½x5	Split.	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant 15	2	2,150	34x4	34x6	Cont.	4-3½x5	Split.	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant 16	2	2,250	34x4	34x6	Cont.	4-3½x5	Split.	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Hahn J-4	1	.....	36x3½	36x5	Cont.	4-3¾x5	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Shel.	Ross
Hahn CD	1½	.....	36x3½	36x6	Cont.	4-4¼x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn DE	2	.....	36x4	36x7	Cont.	4-4¼x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn EE	2½	.....	36x4	36x8	Cont.	4-4½x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn F	3½	.....	36x5	36x10	Cont.	4-4½x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn FE	5	.....	36x6	40x12	Cont.	4-4¾x6	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hal-Fur D	1	2,000	35x5	35x5	Buda	4-4x5	Bosch	West.	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Hal-Fur E	2½	2 750	35x5	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Hall	2	2,875	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	5	4,850	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	7	4,850	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Harvey WEA	1½	2 350	34x3½	34x5	Buda	4-4½x5½	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Harvey WFA	2½	3,300	?6x4	36x7	Buda	4-4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WHA	3½	4 300	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WKA	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Hawkeye K	1½	1,995	34x3½	34x5	Buda	4-3¾x5½	Eise.	.....	Simplx.	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Hawkeye M	2	2,650	36x4	" 6x6	Buda	4-4½x5½	Eise.	West.	Simplx.	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Hendrickson	2½	3,200	36x4	36x7	Buda	4-4½x5½	.....	.....	.....	Strom.	Fuller	.....	worm	Timkn.	Ross
Hendrickson	3½	4,000	36x5	36x5d	Buda	4-4½x5½	.....	.....	.....	Strom.	Fuller	.....	worm	Timkn.	Ross
Hendrickson	5	5,250	36x6	40x6	.....	4-5x6	.....	.....	.....	Strom.	.....	.....	worm	Timkn.	Ross
Highway Kn't A	4	4,800	36x5	36x6	Knight	4-4x6	Eise.	Wag.	Mon.	Zenith	.....	.....	worm	Shel.	.....
Highway Kn't	5	5,600	36x5	40x6d	Knight	4-4x6	Eise.	Wag.	Mon.	Zenith	.....	.....	worm	Shel.	.....
Higrade	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Higrade	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hoover	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Huffman C	1½	1 495	34x3½	34x6	Buda	4-3¾x5	Dixie	.....	.....	Zenith	Fuller	Fuller	worm	Torbn.	Lavn.
Huffman B	1½	1 695	34x3½	34x6	Cont.	4-3¾x5	Dixie	.....	.....	Zenith	Fuller	Fuller	worm	Chgo.	Lavn.
Hurlburt A	1½	2 850	34x4	34x5	Buda	4-4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt B	2½	3 750	36x4	36x4d	Buda	4-4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt C	3½	4 400	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt D	5½	5 250	36x5	40x6	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Independent F	1-2	.....	36x3½	36x5	Cont.	4-3¾x5	Eise.	.....	Pierce	Scheb.	Fuller	Fuller	worm	Wis.	Ross
Indiana 12	1½	.....	34x3½	34x5	Wauk.	4-3¾x5½	Eise.	West.	Wauk.	Strom.	B.&B.	Covert	worm	Shel.	Wol.
Indiana 20	2	.....	36x4	36x7	Ruten.	4-4¼x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana 25	2½	.....	36x4	36x8	.....	4-4¼x5½	.....	.....	.....	.....	.....	.....	worm	.....	.....
Indiana 35	3½	.....	36x5	36x5d	Ruten.	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana 50	5	.....	36x5	40x6d	Wauk.	4-4½x6½	Eise.	West.	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
International H	¾	1,750	36x3½	36x3½	Own	4-3½x5½	Split.	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Ross
International F	1	1,950	36x3½	36x4	Own	4-3½x5½	Split.	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Ross
International K	1½	2,300	36x3½	36x5	Own	4-3½x5½	Split.	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Ross
International G	2	2,700	36x4	36x6	Own	4-4x5	Split.	N. E.*	Own	Ens.*	Own	Own	in-g.	Own	Ross
International L	3½	4,500	36x5	40x10	Own	4-4½x5	Split.	N. E.*	Own	Ens.*	Own	B-Lipe	in-g.	Own	Ross
Jackson C	3½	4,250	36x7	36x7	Cont.	4-4½x5½	Eise.	Eise.	Pierce	Strom.	B.&B.	Own	bevel	Own	Ross
Jumbo 15	1½	2,595	36x9	36x5	Buda	4-3½x5½	N. E.	.....	none	Zenith	Fuller	Fuller	in-g.	Clark	Jacx

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eiseman A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leec Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles., Ruggles. **Carburetor**—Scheb., Schebler; Strom Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn.,Timken; Torbn., Torbenson;Key-H.,Keystone-Hindley; Shel.,Sheldon;Salsby. ,Salisbury;Ind.,Industrial; Chcgo., Chicago-W-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Guide to Truck Specifications—Concluded

These tables are revised and brought up to date monthly

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Jumbo 20	2	2,795	35x5	38x7	Buda	4-3¼x5½	N. E.	.....	none	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 25	2½	3,095	36x4	36x7	Buda	4-4¼x5½	Eise.	.....	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 30	3	3,500	36x6	42x9	Buda	4-4½x5½	Eise.	.....	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 35	3½	4,300	36x5	36x10	Buda	4-4½x6	Eise.	.....	Simplx.	Zenith	B-Lipe	B-Lipe	in-g.	Clark	Jacx.
Jumbo 40	4	4,875	38x7	44x10	Buda	4-4½x6	Eise.	.....	Simplx.	Zenith	B-Lipe	B-Lipe	in-g.	Clark	Jacx.
Kalamazoo G	1½	.....	34x4	34x5	Cont.	4-3¼x5	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Wis.	Ross
Kalamazoo H	2½	.....	34x5	36x7	Cont.	4-4x6	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Kalamazoo K	3½	.....	36x5	36x5d	Cont.	4-4¼x6	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Kankakee E	2½	2,875	34x4	36x6	Cont.	6-3½x5½	Delco	Delco	.....	Zenith	Muncie	Muncie	in-g.	Russel	Ross
Kearns	2	1,350	32x4½	32x4½	Light	4-3¼x4½	Berl.	Dyn.	Mon.	Zenith	B.&B.	G-L	in-g.	Torbn.	Lavn.
Kearns	1½	2,000	34x3½	34x6	H-S	4-3½x5	Berl.	none	Pierce	Zenith	B.&B.	G-L	in-g.	Torbn.	Lavn.
Keldon, 19	2	2,885	36x4	36x7	Buda	4-4¼x5½	Eise.	none	Pierce	Strom.	Fuller	Fuller	in-g.	Russel	Ross
Kelly-S., K-31	1½	3,000	36x3½	36x6	Own	4-3¼x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-32	1½	3,000	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-35	2½	3,500	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-36	2½	3,500	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-40	3½	4,400	36x4	40x5d	Own	4-4½x6½	Eise.	opt.*	Pierce	Zenith	Own	Covert	worm	Own	Gem.
Kelly-S., K-45	4	4,500	36x5	40x6d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Kelly-S., K-50	5	5,150	36x6	40x6d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Kelly-S., K-60	6	5,500	36x6	40x7d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Keystone	1	1,375	31x4*	33x5*	Own	3½x4	A-L	.....	.....	Tillot.	Own	Own	in-g.	Torbn.	Own
Keystone	2	2,100	35x5*	38x7*	Buda	4-3½x5½	Berl.	none	Pierce	Zenith	Fuller	Fuller	in-g.	Russel	Ross
Kimball, B	2	3,675	36x4	36x7	Wis.	4-4 x6	Eise.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, C	2½	3,975	36x4	36x7	Wis.	4-4½x6	Eise.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, K	3	4,400	36x4	36x8	Wis.	4-4½x5½	Berl.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, E	4	5,000	36x5	40x10	Wis.	4-5 1x5½	Berl.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, F	5	5,975	36x6	40x12	Wis.	4-5½x6	Berl.	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Kissel	½	1,875	34x4½*	34x4½	Own	4-3½x5½	Eise.	.....	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Ross
Kissel	1½	2,975	34x3½	34x5	Own	4-3¼x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Own	Jacx.
Kissel	2	2,975	34x4	36x7	Own	4-4¼x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Jacx.
Kissel	3½	3,975	36x5	36x5d	Own	4-4¼x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Lavn.
Kissel	5	4,785	36x6	36x6d	Own	4-4¼x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Ross
Kimball, A	1½	3,075	36x3½	36x5	Wis.	4-4x5	Bosch	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Lavn.
Kleiber, AA	1	.....	34x3½	34x5	Cont.	4-3½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Kleiber, A	1½	.....	36x3½	36x6	Cont.	4-4¼x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, BB	2	.....	36x4	36x3½d	Cont.	4-4¼x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, B	2½	.....	36x5	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, C	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Knox, 35-Tractor	5	6,000	36x5	38x6d	Own	4-5 x5½	Berl.	G.&D.	None	Zenith	Own	Own	Chain	Own	Ross
Knox, 36-Tractor	10	6,500	36x4	38x6d	Own	4-5 x5½	Berl.	G.&D.	None	Zenith	Own	Own	Chain	Own	Ross
Koehler, C	1¼	1,885	34x3	34x5	H-S	4-3½x5	Eise.	none	Simplx.	Zenith	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, M	2½	3,165	36x4	36x7	Herc.	4-4 x5½	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Koehler Trac.,MT	5	3,250	36x4	36x7	Herc.	4-4 x5½	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Larrabee, U	1½	2,250	34x3½	34x5	Cont.	4-3¾x5	Bosch	.....	Simplx.	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, EK&SK	2½	3,250	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, EL & SL	3½	4,000	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, SW&EW	5	4,900	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
L. M. C.	2½	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	.....	in-g.	Russel	.....
Lombard	7	.....	.....	.....	.....	6-5½x7	Simms	.....	Own	Scheb.	.....	.....	worm	.....	.....
Loyal	¾	950	32x4	32x5	LeRoi	4-3¼x4½	A-K	W-L	.....	Strom.	B.&B.	Covert	in-g.	Torbn.	Ross
Loyal, Special	1	1,245	32x4½	32x4½	H-S	4-3½x5	A-K	.....	.....	Strom.	B.&B.	Covert	in-g.	Torbn.	Ross
Loyal	1	1,500	33x5	33x5	H-S	4-3½x5	A-K	W-L	.....	Strom.	B.&B.	Covert	in-g.	Torbn.	Ross
Mack, AB	1½	3,000	36x4	36x3½d	Own	4-4 x5	Dixie	.....	Own...	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack, AB	1½	3,000	36x4	36x3½d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	2	3,300	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack, AB	2	3,300	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack Trac., AB	5	3,400	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack, AC	3½	4,950	36x5	40x5d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack, AC	5	5,500	36x6	40x6d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack, AC	6½	5,750	36x6	40x6d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack Trac., AC	7	4,950	36x5	40x7d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Oneida, B	1¾	2,600	36x3½	36x6	Cont.	4-4¼x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta	worm	Timkn.	Ross
Oneida, C	2½	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta	worm	Timkn.	Ross
Oneida, D	3½	3,700	36x5	36x10	Cont.	4-4½x5½	Bosch	West	Pierce	Strom.	H-Shaw	Cotta	worm	Timkn.	Ross
Oneida, E	5	4,750	36x6	40x12	Cont.	4-5½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta	worm	Timkn.	Ross
Oshkosh	2	3,500	36x6*	36x6*	H-S	4-3½x5	N.E.	N.E.	Duplx.	Zenith	B-Lipe	B-Lipe	bevel	Own	Ross
Packard, E	1½	3,200	34x3½	34x3½d	Own	4-4 x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	2	3,600	34x4	34x4d	Own	4-4 x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	3	4,350	36x5	36x5d	Own	4-4½x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	4	4,550	36x5	40x5d	Own	4-4½x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	5	5,450	36x6	40x6d	Own	4-5 x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	6	5,700	36x6	40x7d	Own	4-5 x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Paige, 52-19	1½	2,680	34x5	38x7	Hink.	4-4 x5½	Bosch	.....	Hink.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	.....
Paige, 50-18	2½	3,150	34x4	34x4d	Cont.	4-4½x5½	Bosch	none	Simplx	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Paige, 51-18	3½	4,150	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Parker, F20	2	3,500	34x4	36x4d	Wis.	4-4x6	Bosch	West.	Mon.	Strom.	B-Lipe	Own	worm	Own	Ross
Parker, J20	3½	4,400	36x5	40x5d	Wis.	4-4½x6	Bosch	West.	Mon.	Strom.	B-Lipe	Own	worm	Own	Ross
Parker, M20	5	5,500	36x6	40x6d	Cont.	4-4½x6	Bosch	West.	Simp.	Strom.	B-Lipe	Own	worm	Timkn.	Ross
Patriot, Revere	¾	1,890	35x5*	35x5*	Cont.	4-3½x5	.....	.....	.....	Strom.	B.&B.	Covert	worm	Empire	.....
Patriot, Lincoln	1½	2,650	34x3½	34x3½d	Hink.	4-4 x5½	Split.	.....	Hink.	Strom.	Covert	Fuller	worm	Empire	Ross
Patriot, Wash	2½	3,650	36x4	36x4d	Hink.	4-4½x5½	.....	.....	Hink.	Strom.	Covert	Covert	worm	Empire	Ross
Peerless															
Peerless															
Peerless															
Pierce-Arrow, X4	2	4,300	36x4	36x4d	Own	4-4 x5½	Dixie	Vesta	Own	Own	Own	Own	worm	Own	Own
Pierce-Arrow, R9	5	5,500	36x5	40x6d	Own	4-4½x6	Dixie	Vesta	Own	Own	Own	Own	worm	Own	Own
Pioneer All Steel,F	2	2,790	36x4	36x7	Cont.	4-4¼x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Pony	¼	320	28x3	28x3	Own	4-2½x4	A-K	opt.	opt.	Strom.	.....	.....	Chain	Own	Own
Power, B	2	2,950	36x4	36x4d	Cont.	4-4¼x5½	Simms	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Ranier, R-11	¾	1,750	34x4½	34x4½	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Ranier, R-6	1½	1,975	34x3	34x4	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Ranier, R-8	2	2,400	34x4	34x6	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Reliance, A-10	1½	2,500	36x3½	36x5	Buda	4-4 x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	ext-g.	Badger	Ross
Reliance, B-20	2½	3,200	36x4	36x4d	Buda	4-4½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Cotta	ext-g.	Badger	Ross
Reo, F	¾	1,285	34x4½	34x4½	Own	4-4½x4½	Remy	Remy	none	John.	Own	Own	bevel	Own	Own
Republic, 10	1	1,550	34x3	34x4	Cont.	4-3¼x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 11X	1½	1,885	34x3½	34x5	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 19	2½	2,395	36x4	36x7	Cont.	4-4¼x5½	Eise.	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 20	3½	3,595	36x5	36x10	Cont.	4-4½x5½	Eise.	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Reynolds	1½	2,650	36x3½	36x6	Own	4-4x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	2½	3,350	36x4	36x8	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	3½	4,350	36x5	36x5	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	5	5,350	36x6	36x6d	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Riker, B	3	4,600	36x5	36x5d	Own	4-4½x6	Berl.	West.	Own	B.&B.	Own	Own	worm	Own	Ross
Riker, BB	4	4,700	36x5	36x6	Own	4-4½x6	Berl.	West.	Own	B.&B.	Own	Own	worm	Own	Ross
Rock Falls, 9	1½	.....	35x5	35x5	Buda	6-3½x5½	Bosch	West.	none	Ray.	B.&B.	G-Lees	bevel	Col.	Gem
Rowe, CDW	2	3,300	34x4	36x3½	Wis.	4-4 x4	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CDW	2½	3,575	34x4	36x4d	Wis.	.....	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CW	1½	2,800	36x6*	36x6*	Wis.	4-3½x5	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GSW	3	3,900	36x5	36x5d	Wis.	4 x6	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GPW	3P	4,950	38x7P	42x9P	H-S	3½x5	A-K	West.	.....	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, HW	4	4,350	36x5	36x6d	Wis.	4½x6	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, FW	5	5,300	36x6	40x6d	Wis.	4½x6	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Sandow, G	1	1,895	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, CG	1½	2,190	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, J	2½	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, I	2	2,375	36x4	36x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Sandow, K	3½	3,995	36x5	36x5d	Cont.	4-4½x5	Bosch	.....	Men.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, M	5	4,775	36x6	40x6d	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, W-25	2½	3,290	36x5	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, W-35	3½	4,050	36x6	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Sanford, W-50	5	4,950	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Schacht	2	.....	36x4	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart.	Own	worm	Own	Own

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles., Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield, King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salsbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Mack, AC	7½	6,000	36x7	40x7d	Own	4–5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack Trac., AC	10	5,500	36x6	40x6d	Own	4–5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack Trac., AC	13	5,750	36x6	40x6d	Own	4–5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack Trac., AC	15	6,000	36x7	40x7d	Own	4–5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem
Master, JI	1½	2,190	34x3½	34x5	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	Fuller	Fuller	in-g.	Torbn.	Ross
Master, JW	1½	2,290	34x3½	34x5	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	Fuller	Fuller	worm	Timkn.	Ross
Master, M	2	2,590	34x4	36x7	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Master, O	2	2,690	34x4	36x7	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Master, W	2	2,890	34x4	36x7	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master, WL	2	2,990	34x4	36x7	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master, A	3½	3,990	36x5	40x5d	Buda	4–4½x6	Eise.	opt.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master, B	5	4,990	36x6	40x6d	Buda	4–4¾x6½	Eise.	opt.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master Trac., T	6	2,850	34x4	36x4d	Buda	4–4¼x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Maxwell	1½	1,310	32x3	32x4	Own	4–3¼x4½	A-K	A-L	Own	Spec.	Own	Own	worm	Own	Own
Menominee, Hurryton	1	2,080	34x3½	34x5	Wis.	4–3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Menominee, H	1½	2,725	36x3½	36x5	Wis.	4–4 x5	Eise.	.....	Mon.	Stron.	Fuller	Fuller	worm	Wis.	Ross
Menominee, D	2	3,245	36x4	36x4d	Wis.	4–4 x6	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Menominee, G	3½	4,270	36x5	36x5d	Cont.	4–4½x5½	Eise.	.....	Mon.	Strom.	B.&B.	Cotta	worm	Timkn.	Ross
Menominee, J	5	5,450	36x6	40x6d	Wis.	4–4¾x5½	Eise.	.....	Mon.	Strom.	B.&B.	Cotta	worm	Timkn.	Ross
Modern															
Moreland, 19-B	1½	2,930	36x3½	36x5	Cont.	4–4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 19-C	2½	3,775	36x4	36x7	Cont.	4–4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 19-G	4	4,875	36x5	40x5d	Cont.	4–4½x6	Dixie	.....	Cont.	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 19-J	5	5,350	36x6	40x6d	Cont.	4–4½x6	Dixie	.....	Cont.	Miller	Own	Own	worm	Timkn.	Ross
Muskegon, 20	2	2,325	36x4	36x6	Cont.	4–4½x5¼	Eise'	.....	Pierce	Detroit	Fuller	Fuller	in-g.	Torbn.	Lavn.
Mutual	2	3,375	36x4	36x8	Wis.	4–4¼x6	Bosch	West.	Duplx.	Strom.	H-Shaw	Fuller	worm	Wis.	Ross
Mutual	3½	.....	36x5	.....	Wis.	4–4½x5½	Bosch	West.	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Mutual	5	.....	36x6	.....	Wis.	4–5.1x5½	Bosch	West.	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Napoleon, 9	1	1,385	32x3½	32x4	Gray	4–3½x5	Conn.	A-L	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Napoleon, 11	1½	1,660	34x4	34x5	Gray	4–3½x5	Conn.	A-L	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn
Nash, 2018	1	1,785	34x3	34x3	Own	4–3½x5½	Eise.	A-L	Simplx.	Strom.	B.&B.	Detroit	in-g.	Clark	Jacx.
Nash, 3018	2	2,395	34x4	36x6	Own	4–3½x5½	Eise.	A-L	Simplx.	Strom.	B.&B.	Detroit	in-g.	Clark	Jacx.
Nash, 4017	2	3,250	36x5	36x5	Buda	4–4¼x5½	Eise.	none	Simplx.	Strom.	B.&B.	Own	in-g.	Own	Lavn.
Nelson & LeM., F	1	2,250	36x3½	36x4	Cont.	4–4¼x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM.,F2	2	.....	36x4	36x7	Cont.	4–4¼x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson&LeM.,F3½	3½	.....	36x5	36x5d	Cont.	4–4¼x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson&LeM,FC5	5	.....	36x6	40x6d	Cont.	4–4½x6	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, D	2	3,000	36x4	36x6	Cont.	4–4½x5½	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, H	2½	3,400	36x4	36x7	Cont.	4–4½x5½	Eise.	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Noble, A-20	1	.....	36x3½	36x4	Buda	4–3½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, B-30	1½	.....	36x3½	36x5	Buda	4–3½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, C-40	2	.....	36x4	36x7	Buda	4–4x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, D-50	2½	.....	36x4	36x8	Buda	4–4½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, E-70	3½	.....	36x5	36x10	Buda	4–4½x6	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Northway, B-2	2	3,250	36x4	36x4d	Own	4–4 x6	Wag.	West.	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Northway, B-3½	3½	4,250	36x5	40x5d	Own	4–4 x6	Wag.	West.	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Norwalk, 2000	1	.....	34x4*	34x4*	Lyc.	4–3½x5	Delco	Dneto.*	none	Zenith	B.&B.	G-Lees	worm	Stand.	C.A.S.
Norwalk, 3000	1½	.....	34x4	34x5	Lyc.	4–3½x5	Delco	Dneto.*	none	Zenith	B.&B.	G-Lees	worm	Stand.	C.A.S.
O. K	1½	2,450	36x4	36x5	Buda	4–4½x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chcgo.	Ross
O. K	2½	3,150	36x4	36x8	Buda	4–4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
O. K	3½	4,100	36x5	36x10	Buda	4–4½x6	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
Old Hickory, W	1¼	2,175	36x3½	36x4	Cont.	4–3½x5	Eise.	.....	Pierce	Strom.	B.&B.	G-Lees	worm	Timkn	Lavn.
Oldsmobile	½	1,250	35x5*	35x5*	Own	4–3 1/4x5½	A-L	A-L	.....	Zenith	.....	.....	in-g.	Torbn.	Jacx.
Old Reliable, A	1½	2,350	34x3½	36x6	Wis.	4–4 x5	Bosch	opt.	Mon.	Ray.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Old Reliable, B	2½	3,500	36x4	36x4d	Wis.	4–4¼x6	Bosch	opt.	Mon.	Ray.	Fuller	Fuller	worm	Shel.	Ross
Old Reliable, C	3½	4,250	36x5	36x5d	Wis.	4–4½x5½	Bosch	opt.	Mon.	Ray.	Univ.	Savg.	worm	Shel.	Ross
Old Reliable, D	5	5,250	36x6	40x6d	Wis.	4–5.1x5½	Bosch	opt.	Duplx.	Strom.	Univ.	Savg.	worm	Shel.	Ross
Old Reliable, K, L & M	7½	6 250	36x6	40x7d	Wauk.	4–4¾x6¾	Bosch	none	Wauk.	Strom.	Univ.	Savg.	Chain	Shel.	Ross
Oneida, A	1¼	2,290	36x3½	36x5	Cont.	4–3¾x5¼	Bosch	West.	Pierce	Strom	H-Shaw	Cotta	worm	Timkn.	Ross
Schacht	2½	.....	36x4	36x4d	Buda	4–4¼x5½	Bosch	none	Duplx.	Scheb.	Hart.	Own	worm	Own	Own
Schacht	3½	.....	36x5	36x5d	Buda	4–4¼x6	Bosch	none	Duplx.	Scheb.	Hart.	Own	worm	Own	Own
Schacht	5	.....	36x5	40x6d	Buda	4–4½x6	Bosch	none	Duplx.	Scheb.	Hart.	Own	worm	Own	Own
Schwartz, B	1½	2,175	34x3½	34x5	Cont.	4–3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Schwartz, C	2½	2,675	36x4	36x7	Cont.	4–4¼x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Schwartz, D	5	4,500	36x6	36x6d	Buda	4–4½x6	Bosch	Bijur	Duplx.	Strom.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Selden	1½	.....	34x3½	35x5	Cont.	4–3½x5	Bosch	N-E	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Selden	2½	.....	36x4	36x7	Cont.	4–4¼x5¼	Eise.	N-E	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Selden	3½	.....	36x5	36x10	Cont.	4–4½x5½	Eise.	N-E	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Selden	5	.....	36x6	40x12	Cont.	4–4¾x6	Eise.	Conn.	Pierce	Strom.	Dett.	B-Lipe	worm	Timkn.	Gem.
Seneca, L	½	.....	30x3½	30x3½	LeR.	4–3¼x4½	Conn.	A-Ch.	.....	.....	Scheb.	B.&B.	Warren	bevel	Peru
Service, 220	1	2,245	34x3½	34x5½*	Buda	4–3½x5½	Eise.	West.*	none	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Service, 31	1½	2,785	36x3½	36x6	Buda	4–4x5½	Eise.	West.*	Duplx.	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 36	1½	3,215	35x5*	38x7*	Buda	4–4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 51	2½	3,245	36x4	36x7	Buda	4–4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 71	3½	4,085	36x5	36x5d	Buda	4–4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 76	3½	4,285	36x5	36x5d	Buda	4–4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 101	5	5,145	36x6	40x6d	Buda	4–4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Shaw, M-2	¾	1,975	32x4	32x4	Cont.	4–3¾x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Shaw, M-4	1	2,300	34x3	34x4	Cont.	4–3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Signal, F	1	.....	34x3½	36x5	Cont.	4–4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, H	1½	.....	34x4	36x6	Cont.	4–4½x5¼	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, J	2	.....	34x4	36x8	Cont.	4–4¼x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, M	3½	.....	36x5	40x5d	Cont.	4–4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, R	5	.....	36x6	40x6d	Cont.	4–4½x6	Eise.	none	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Southern, A	1	1,495	34x4	34x4	Buda	4–3½x5½	Delco	.....	Pierce	Zenith	B.&B.	.....	.....	.....	.....
Southern, B	1½	1,795	34x4	34x4	Cont.	4–3½x5	Delco	.....	Pierce	Zenith	B.&B.	.....	.....	.....	.....
Standard, 56	1	2,250	34x3½	34x4	Cont.	4–3½x5	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 76	2½	3,200	36x4	36x7	Cont.	4–4½x5¼	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 66	3½	4,200	36x5	36x5	Cont.	4–4½x5½	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Standard, 86	5	5,000	36x6d	40x6d	Cont.	4–4½x5½	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Sterling	1½	2,850	36x3½	36x5	Own	4–4x5½	Eise.	.....	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	2	3,100	36x4	36x6	Own	4x5½	Eise.	.....	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	2½	3,475	36x4	36x4d	Own	4–4½x5½	Eise.	West.	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	3½	4,550	36x5	40x5d	Own	4–4½x6¼	Eise.	West.	Wauk.	Ray.	M.&E.	Own	worm	Timkn	Ross
Sterling, W	5	5,350	36x6	40x6d	Own	4–5x6¼	Eise.	West.	Wauk.	Ray.	M.&E.	Own	worm	Timkn	Ross
Sterling, C	5	5,600	36x6	40x5d	Own	4–5x6¼	Eise.	West.	Wauk.	Ray.	M.&E.	Own	chain	Own	Ross
Sterling	7½	6,000	36x6	40x7d	Own	4–5x6¼	Eise.	West.	Wauk.	Ray.	M.&E.	Own	chain	Own	Ross
Stewart, 11	¾	1,350	32x4*	32x4*	LeR.	4–3¼x4½	Eise.	.....	none	Zenith	B.&B.	Durston	in-g.	Clark	C.A.S.
Stewart, 8	1	1,695	34x3½	34x4	Cont.	4–3½x5	Eise.	.....	Spec.	Zenith	B.&B.	Durston	in-g.	Clark	Gem.
Stewart, 9	1½	2,250	34x3½	34x5	Cont.	4–3½x5	Eise.	.....	Spec.	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Stewart, 7	2	2,875	34x4	34x4d	Cont.	4–4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Stewart, 10	3½	3,895	36x5	36x5d	Cont.	4–4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Stoughton, B	1½	2,200	36x3½	36x5	Wauk.	4–3¾x5¼	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Stoughton, D	2	2,600	36x4	36x7	Wauk.	4–4x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Stoughton, E	3	3,000	36x4	36x5d	Wauk.	4–4½x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Sullivan, F	1½	2,350	36x4	36x5	Buda	4–3½x4½	Bosch	.....	none	Strom.	.....	Covert	worm	Timkn.	Ross
Sullivan, E	2	2,975	36x4	36x7	Buda	4–4½x5½	Bosch	.....	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sullivan, H	3½	.....	36x5	36x5d	Buda	4–4½x6	Bosch	.....	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Super Truck, 50	2½	3,200	36x4	36x8	Wis.	4–4x6	.....	Vesta	Simplx.	Zenith	Fuller	.....	worm	Shel.	Lavn
Super Truck, 70	3½	4,100	36x5	40x5d	Wis.	4–4¼x6	.....	Vesta	Simplx.	Zenith	Fuller	.....	worm	Shel.	Ross
Super Truck, 100	5	4,800	36x5	40x6d	Wis.	4–4¼x6	.....	Vesta	Simplx.	Zenith	Hill	.....	worm	Shel.	Ross
Superior, D	1	1,600	34x4½	34x4	Cont.	4–3½x5	Eise.	Opt.	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn.	C.A.S.
Superior, E	2	2,475	34x4	36x6	Cont.	4–4¼x5¼	Eise.	Opt.	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn	Ross
Texan	1½	1,525	34x4*	34x4	Lyc.	.....	.....	Dneto.*	.....	.....	.....	Muncie	worm	Chcgo.	.....
Tiffin, A	⅝	1,100	35x4½	35x4½*	Cont.	4–3½x5	Bosch	none	none	Scheb.	Det.	Det.	in-g.	Russel	Lavn.
Tiffin, GW	1½	2,415	36x3½	36x5	Cont.	4–3¾x5¼	Bosch	none	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Tiffin, MW	2½	3,200	36x4	36x3½d	Cont.	4–4¼x5¼	Bosch	none	Pierce	Scheb.	Hart	Fuller	worm	Shel.	Ross
Tiffin, PW	3½	4,175	36x5	36x5d	Cont.	4–4½x5½	Bosch	West.*	Pierce	Scheb.	B.&B.	Fuller	worm	Shel.	Ross
Tiffin, RW	5	5,250	36x6	40x6d	Cont.	4–4½x5½	Bosch	West.	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, SW	9	5,450	36x6	40x12	Cont.	4–4½x5½	Bosch	West.*	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Titan, 2½	2½	3,400	34x4	36x4d	Buda	4–4¼x5½	Eise.	none	Simplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Wol.

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles., Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury Ind, Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Guide to Truck Specifications—Concluded

These tables are revised and brought up to date monthly

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Titan, T.	3½	4,400	36x5	40x5d	Buda	4-4½x6	Eise.	West.	Simplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Titan, H.	6	5,400	36x6	40x6d	Buda	4-4½x6	Eise.	West.	Simplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Tower, J.	1½	.....	35x5	38x7	Cont.	4-4¼x5½	Bosch	.....	.....	Zenith	.....	.....	worm	.....	Ross
Tower, H.	2½	.....	36x4	36x7	Cont.	4-4¼x5½	Bosch	.....	.....	Zenith	Fuller	Fuller	worm	.....	Ross
Tower, G.	3½	.....	36x5	36x5	Cont.	4-4½x5½	Bosch	.....	.....	Zenith	Fuller	Covert	in-g.	Russel	Own
Traffic	2	1,395	34x3½	34x5	Cont.	4-3½x5	Bosch	none	none	Carter	Covert	Fuller	in-g.	Clark	Jacx.
Transport, 20	1	1,750	34x3	34x4	Cont.	4-3½x5	Eise.	none	Duplx.	Strom.	Fuller	Fuller	in-g.	Clark	Jacx.
Transport, 30	1½	2,050	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Duplx.	Strom.	Fuller	Fuller	in-g.	Clark	Jacx.
Transport, 50	2	2,585	36x4	36x7	Cont.	4-4¼x5½	Eise.	.....	Duplx.	Strom.	Fuller	Covert	.....	Shel.	Ross
Traylor, B.	1	1,950	34x3½	34x5	Buda	4-3¾x5⅛	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Traylor, C.	1½	2,750	36x4	36x6	Buda	4-4x5½	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Traylor, D.	2½	3,250	36x4	36x7	Buda	4-4½x5½	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Triangle, AA	¾	1,550	35x5	35x5	H-S	4-3¾x5	N. E.	N. E.	none	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, A	1½	2,185	34x3½	34x6	Wauk.	4-3½x5½	Eise.	none	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, C	2	2,585	36x4	36x6	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, B	2½	2,850	36x7	36x7	Ruten.	4-4½x5½	Eise.	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Union, F.	2½	2,675	36x4	36x7	Wis.	4-4x6	Eise.	opt.	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
Union, H.	4	3,500	36x6	36x10	Wis.	4 4½x6	Eise.	opt.	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
United, A.	1½	2,100	36x3½	36x6	Buda	4-3½x5½	Eise.	opt.	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, B.	2½	2,850	36x4	36x7	Buda	4-4¼x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, C.	3½	3,750	36x5	36x5d	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, V.	5	4,750	36x5	40x6d	Buda	4-4½x6	Eise.	opt.	none	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
U. S., N.	1½	2,250	36x3½	36x5	Cont.	4-3¾x5	Eise.	opt.	none	Strom.	.....	B-Lipe	worm	Shel.	Lavn.
U. S., NW.	1½	2,650	36x3½	36x5	Cont.	4-3¾x5	Eise.	opt.	Own	Strom.	.....	B-Lipe	worm	Shel.	Lavn.
U. S., R.	2½	3,850	36x4	36x4d	Own	4-4¼x5½	Eise.	opt.	Own	Strom.	.....	B-Lipe	worm	Shel.	Lavn.
U. S., S.	3½	4,450	36x5	36x5d	Own	4-4½x5½	Eise.	opt.	.....	Strom.	.....	B-Lipe	worm	Shel.	Lavn.
U. S., T.	5	5,600	36x6	40x6d	.....	4-4½x6½	Eise.	opt.	.....	.....	.....	.....	in-g.	Torbn.	Own
Velie, 46	1½	1,925	36x3½	36x5	Cont.	4-3½x5	Bosch	none	none	Strom.	B.&B.	Durst.	in-g.	Timkn.	Gem.
Velie, 26-B	3½	3,900	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	C.A.S.
Vim, 27	⅔	1,095	31x4	31x4	Own	4-3x4½	A-K	West.	none	Zenith	Own	Own	worm	Shel.	C.A.S.
Vim, 28	1	1,350	32x4½	32x4½	Own	4-3x4½	A-K	West.	none	Zenith	Own	Own	worm	Shel.	Gem.
Vim, 25	2	2,195	35x5	35x5	Herc.	4-3½x5½	Split.	none	none	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Vim, 22	3	3,150	36x4	36x6	Herc.	4-3½x5½	Split.	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Vim, 23	.....	3,950	36x5	36x5d	Herc.	4-4¼x5½	Split.	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Walker Johnson,B	2½	2,890	36x4	36x8	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	ext-g.	Own	Own
Walter, MO.	3	.....	40x4d	40x4d	Own	4-4½x6	.....	none	Own	Zenith	B-Lipe	Own	Own	Own	Ross
Walter, S.	5	5,500	36x6	40x6d	Wauk.	4-4½x6½	Simms	West.	Own	Strom.	B-Lipe	Warn.	in-g.	Own	Ross
Ward La France, 2-B	2½	3,390	36x4	36x7	.....	4-4½x5½	Bosch	opt.	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Ward La France, 4-A	3½	4,290	36x5	36x5d	.....	4-4½x6½	Bosch	opt.	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Ward La France, 5-A	5	5,290	36x6	40x6d	.....	4-5x6½	Bosch	opt.	Own	Zenith	B-Lipe	B-Lipe	worm	Own	Lavn.
Watson	¾	1,750	34x4½	34x4½	Wauk.	4-3½x5½	Dyn.	Dyn.	Wauk.	John.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Watson	¾	.....	36x5	36x10	Cont.	4-4½x5½	Simms	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	bevel	Own
White, 15	2	2,400	34x4½*	34x4½*	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd	Own	Own
White, 20	3	3,300	36x4	36x7	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd	Own	Own
White, 40	5	4,300	36x5	40x5d	Own	4-3½x5½	.....	.....	Own	Own*	Own	Own	d-rd	Own	Own
White, 45	5	5,000	36x6	40x6d	Own	4-4½x5½	.....	.....	Own	Own*	Own	Own	d-rd	Own	Own
White Hickory, H	1½	2,475	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Simplx.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
White Hickory, K	2½	3,075	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Simplx.	Strom.	Fuller	Fuller	worm	Timkn.	Lavn.
Wichita, L.	1½	2,350	36x3½	36x5	Own	4-3½x5	.....	.....	none	Strom.	Own	Covert	worm	Shel.	Ross
Wichita, M.	2	2,750	36x4	36x6	Own	4-3½x5½	.....	.....	none	Strom.	Own	Covert	worm	Shel.	Ross
Wichita, R.	2½	2,950	36x4	36x7	Own	4-3½x5½	.....	.....	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, RX	2½	3,400	36x4	36x6	Wauk.	4-4¼x5½	.....	.....	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, O.	3½	3,750	36x5	36x5d	Beav.	4-4½x6	.....	.....	Duplx.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, S.	6	5,400	36x6	40x6d	Beav.	4-4½x6	.....	.....	Duplx.	Strom.	Hart.	Own	d-rd	Shel.	Gem.
Wilcox, A-1	1	.....	35x5	35x5	Buda	4-3½x5½	Bosch	nene	Pierce	Strom.	B-Lipe	B-Lipe	worm	Wis.	Gem.
Wilcox, B.	1½	.....	36x4	36x5	Own	4-4½x5	Bosch	none	Pierce	Wil-B	Own	Own	worm	Wis.	Own
Wilcox, C.	2½	.....	36x4	36x6	Own	4-4½x6	Bosch	none	Pierce	Wil-B	Own	Own	worm	Shel.	Own
Wilcox, E.	3½	.....	36x5	36x5d	Buda	4-4¼x5	Bosch	none	Wauk.	Wil-B	Own	Own	worm	Shel.	Own
Wilcox, W.	5	.....	36x5	40x6d	Wauk.	4-4½x6½	Bosch	none	Pierce	Wil-B	Own	Own	worm	Timkn.	Ross
Wilson, F.	1½	2,450	36x3½	36x5	Cont.	4-3½x5	Eise.	opt.	Pierce	Marvel	B.& B.	B-Lipe	worm	Timkn.	Ross
Wilson, EA.	2½	3,150	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Pierce	Marvel	B.& B.	Warner	worm	Timkn.	Ross
Wilson, G.	3½	3,950	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Pierce	Marvel	Warner	Warner	worm	Timkn.	Ross
Wilson, H.	5	4,800	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Pierce	Marvel	Warner	Warner	worm	Timkn.	Ross
Winther, 39.	1½	2,325	34x3½	34x5	Wis.	4-3½x5	Eise.	Bijur.*	.....	Strom.	Fuller	Fuller	in-g	Clark	Lavn.
Winther, 439.	1½	2,575	32x4	32x4	Wis.	4-3¾x5	Eise.	.....	.....	Mast.*	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 49.	2	.....	34x4	34x4d	Wis.	4-4x5	Eise.	Bijur.*	.....	Mast.*	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 70.	3	4,100	36x5	36x5d	Wis.	4-4x6	Eise.	Bijur.*	.....	Mast.*	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 89.	4	4,500	36x5	40x5d	Wis.	4-4½x6	Eise.	Bijur.*	Simplx.	Mast.*	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 109.	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	Bijur.*	Simplx.	Mast.*	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 129.	6	5,250	36x6	40x12	Wis.	4-5½x6	Eise.	Bijur.	Simplx.	Mast.*	B.& B.	B-Lipe	in-g	Clark	Lavn.
Winther, 149.	7	5,500	36x6	40x7d	Wis.	4-5½x6	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g	Clark	Ross
Winther, 459.	2½	.....	34x5	34x5	Wis.	4-4x5	Eise.	Bijur.	.....	Mast.	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 479.	3½	4,900	36x5	36x5d	Wis.	4-4½x6	Eise.	Bijur.	.....	Mast.	B.& B.	B-Lipe	in-g	Clark	Ross
Winther, 979.	5	4,250	38x7	42x9	Wis.	4-4½x6	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, N.	1	2,000	36x3*	36x4*	Cont.	4-3½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, P.	2½	2,950	36x3½*	36x3½d	Cont.	4-4½x5½	Eise.	G&D*	Mon.	Strom.	Fuller	Fuller	in-g	Russel	Gem.
Wolverine, C.	1½	2,380	34x3½	34x5	Cont.	4-3½x5	Eise.	G&D	Mon.	Strom.	Fuller	Fuller	in-g	Russel	Gem.
Woverine, D.	2	2,650	34x4	34x3½d	Cont.	4-3½x5	Eise.	G&D	Mon.	Strom.	Fuller	Fuller	in-g	Russel	Gem.

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; MBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eiseman A-K, Atwater Kent; Koko., Kokomo; Split, Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leec Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont. Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles., Ruggles. **Carburetor**—Scheb., Schebler: Strom Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign: Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; B-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ex-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-W-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

LAMBERT TIRE REORGANIZES

Barberton, O., March 6—The Lambert Tire & Rubber Co. is effecting changes in their organization, together with improvements calculated to double the production of the factory. H. H. Lambert has been re-elected president of the company, Judge Arthur Langwith, vice-president and chairman of the board of directors; N. W. Coyle, vice-president and director, and Porter E. Ramsey, a director an general superintendent of the factory. J. H. Hausan has been re-elected secretary-treasurer and also temporarily replaced G. K. Fargo as general manager. R. S. Teagle, formerly with the Biltwell Tire & Rubber Co. has been appointed Minnesota distributor for the company.

COOPER WITH KEYSTONE MOTOR

Philadelphia, March 6—The Keystone Motor Truck Corp. of this city, has appointed M. S. Cooper sales manager. Mr. Cooper was formerly connected with the sales department of Willys-Overland, Inc., as head of the commercial car division.

MENOMINEE TRUCKS REORGANIZED

Clintonville, Wis., March 8—Announcement is made of the organization of the Menominee Motor Truck Co., of Wisconsin to take over the property and assets of the Menominee Motor Truck Co., Menominee, Mich. The company will continue production in Menominee.

The following were elected directors of the new company: W. A. Olen, D. J. Rohrer, Charles Hagen, Antone Kuckuk, A. A. Washburn, Charles F. Folkman, James A. Bell, Fred R. Scobie and Edward Fleshow. Antone Kockuk was elected president, Charles Hagen, vice-president, Charles F. Folkman, treasurer, and James A. Bell, secretary and general manager.

BUILD OWN FOUNDRY

Kalamazoo, Mich., March 8—Fuller & Sons were forced to start a foundry of their own when they were unable to obtain sufficient grey-iron castings.

The first run of iron from the new foundry was poured Feb. 27, and it is hoped the foundry will be in full operation before the end of this month.

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 88

One of a series of weekly pages of information valuable to service men and dealers—save this page

LEXINGTON (Formerly Howard)

Year	Model	Cyls.	Price	Serial Numbers
1913	D-F	4	$1750	
	G	6	2500	Number plate on tonneau floor board
1914	4-H	4	1335	
1915	4-K	4	1375	
	6-L	6	1875	
	6-M	6	2575	
1916	6-N	6	1875	Number plate on dash, right side, under hood
	6-O-16	6	1075	
1917	6-O-17	6	1185-1285	Number plate on dash, right side, under hood, and on top of flywheel housing
	6-P	6	2875	Number plate on dash, right side, under hood
1918	O	6	1345	
	R	6	1585-1685	Number plate on dash, right side, under hood, left front spring, and on left rear kick-up
1919	R-19	6	1785	17296
1920	S	6	1885	18001 up Number plate on dash, right side, under hood, on left front spring crown, left rear motor arm, and on right side of rear side rail

LIBERTY

Year	Model	Cyls.	Price	Serial Numbers
1916	10-A	6	$1095	30501-31500
1917	10-B	6	1195	31501-33500 approximately
1918	10-B	6	.....	33501-36450
1919	10-B	6	.....	36451-42250
1920	10-C	6	.....	50500 up Numbers on left side front frame end; motor numbers, 21001 to 27001, on left side of motor

LOCOMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	L	4	$3500	
	M	6	4800	
1913	L	4	3600	
	R	6	4400	
	M	6	5100	
1914	38 RD & LD	6	4400	
	48 RD & LD	6	5100	
1915	38R-5	6	4400	
	48M-5	6	5100	
1916	38	6	4400	(Refuse to give serial numbers)
	48	6	5100	
1917	38	6	4600	
	48	6	4600	
1918	38	6	5000	
	48	6	5950	
1919	38	6	.....	
	48	6	.....	
1920	38	6	.....	
	48	6	8100	

LORRAINE (Previous to 1920, See Hackett)

Year	Model	Cyls.	Price	Serial Numbers
1920	.....	4	$1425	1000

MAIBOHM

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	$830	1-500 Number plate on dash or under front seat
1918	B	6	1290	501-2350
1919	B	6	1395	2351-6200
1920	B	6	1395	6201 up Number plate on left side engine Engine number same as car number

MARMON

Year	Model	Cyls.	Price	Serial Numbers
1912	32	4	$2750	112001-1212001
1913	32	4	3000	2113001-2813001
	48	6	5000	1113002-1813000
1914	41	6	3250	114002-814000
	48	6	5000	1114002-1814000
1915	41	6	3250	115002-815000
	48	6	5000	1215002-1815000
1916	41	6	3250	116002-816000
	34	6	2750	1516002-1816000
1917	34	6	3100-5500	317002-817000
1918	34	6	3550-6500	418002-818000
1919	34	6	3950-5750	419001-819001
1920	34	6	4650-6450	2200001-8200001 Numbers on heel board of driver's seat and on left side of main frame

MAXWELL

Year	Model	Cyls.	Price	Serial Numbers
1912	16	2	$625	
	25	4	950	
	30	4	1150	
	36	4	1480	
1913	22	4	785	
	30	4	1145	
	40	4	1675	
1914	25	4	750	1-14000
	35	4	1225	
	50-6	6	1975	
1915	25	4	695	14001-52000
		Gas Light	750	
		Electric Light		52001-113205
1916	25	4	655	
1917	25 7- 1-16	4	595	113206-193800
	1- 1-17	4	635	
	1- 1-17	4	665	
1918	25 7- 1-17	4	655	193801-239822
	8- 6-17	4	745	
	3- 1-18	4	825	
1919	25 7- 1-18	4	825	239823-266800
	10- 4-18	4	895	
1920	25 7- 1-19	4	895	266801 up
	7-12-19	4	985	Number on name plate on right end of front seat base

McFARLAN

Year	Model	Cyls.	Price	Serial Numbers
1912	26	6	$2100	500-1000
1913	27	6	2590	3000-4000
1914	65	6	2900	4000-6000
1915	77	6	2900	6000-7000
1916	107	6	2900	9000-10000
1917	127	6	3200	10000-11000
1918	127	6	3900-4300	18000 up
1919	127	6	.....	19000-19999
1920	.....	....	.....	20000 up Number plate on dash and on right frame horn

MERCER

Year	Model	Cyls.	Price	Serial Numbers
1912	35R	4	$2500	588-990
	35 AB	4	2750	
1913	J & K	4	2700	991-1590
	G	4	2900	
1914	35J	4	2600	1591-2098
	35 HO	4	2900	
1915	22-70	4	3000	2099-2549
1916	22-72	4	3000	2550-3299
1917	22-73	4	3500	3300-4099
1918	Series 4	4	4200	4100-4600
			4500	
1919	Series 5	4	4200	4600 up
			4500	
1920	Series 5	4	4950	Number on dash plate

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Indianapolis, Ind.	Automobile Show	March 8 to 13
New Orleans	Automobile Show	March 8 to 14
Boston, Mass.	Mechanics' Bldg.	March 13 to 20
La Salle, Ill.	Illinois Valley Automobile Dealers' Ass'n.	March 12 to 14
Great Falls, Mont.	Automobile Show	March 15 to 20
Wilkes-Barre, Pa.	Passenger Car & Truck Show	March 15 to 22
Duluth, Minn.	Automobile Show	March 22 to 27
Oklahoma City, Okla.	Oklahoma City Dealers' Ass'n	March 22 to 27
Torrington, Conn.	Automobile Show	March 22 to 27
Utica, N. Y.	Annual Automobile Show	March 22 to 27
Columbia, S. C.	Automobile Show	March 22 to 27
Newton, Kans.	Automobile Show	March 25 to 27
Hutchinson, Kans.	Automobile Show	March 25 to 27
Goldsboro, N. C.	Goldsboro Automotive Trade Ass'n	March 31 to Apr. 3
Gloversville, N. Y.	Automobile Show	April 5 to 10
Albany, Ala.	Automobile Show	April 6 to 10
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8

MISCELLANEOUS CONVENTIONS AND MEETINGS

Lake Charles, La.	Louisiana-Mississippi Automotive Trade Ass'n Convention	March 17 to 18

RACES

Beverly Hills, Los Angeles	Track Race	March 17
Indianapolis Speedway	500-Mile Race	May 31
Tacoma, Wash.	Speedway Race	July 5

TOURS

New York-San Francisco	Glidden Tour	September
Lake Huron Tour		July

Big Check for Good Road Bonds—Joseph A. Bentley gave his personal check for $1,309,725.28 for that part of the good roads bond issue of Rapides Parish, which he offered to purchase when the bonds were first talked of. The funds will be used in the construction of good roads in the parish immediately, while the balances of the $2,000,000 issue will be used to retire outstanding road bonds of several districts in the parish.

Automobile Club Aids Recruiting—The Columbus Automobile Club is lending its aid to the War Department for the recruiting of a motor transportation corps for the army. This matter has been called to its attention and the club has taken action to encourage the enlistment of young men who are qualified for the service. It is planned as a start to organize a motor transportation corps from among its own members as a start.

Kentucky Motor Vehicle Registrations—Total motor vehicle registration in Kentucky last year reached 90,190, a gain of 24,320 over 1918. The head of the Automobile Department at Frankfort declares that he will not be surprised if the total registrations in 1920 reach 150,000.

The greatest increase during the year is shown during the period from July 1 to Jan. 1, 1920, when 14,931 motor vehicles were sold, more than 2000 cars in excess of the total number registered during the entire year of 1916. From Jan. 1 to July 1, 1919, 9389 automobiles were purchased by Kentuckians.

Nineteen hundred nineteen motor vehicles are classified as follows: 80,461 passenger cars, 9,029 trucks, 700 dealers demonstration cars.

Of course, last year's big tobacco price, war business, good roads agitation and the wider range one has for pleasure and visiting with an automobile all played their part in the enormous increase in sales this year.

While no separate record of trucks was kept until this year, it is a fact that the number of them has greatly increased, and it is easily understood why they should increase. This year is expected to far exceed the 1919 record on trucks.

Wilmington Changes Traffic Rules—Motorists visiting Wilmington after this month will do well to ask the first policeman they meet about new traffic rules, for nearly all of the streets in the business section have been made one-way thoroughfares, and there are other regulations as to parking, turning, etc., that are likely to catch the unwary. These rules are effective March 1 and are radically different from the old ones, resulting from traffic congestion in the downtown district.

Pennsylvania Abolishing Grade Crossings—Plans for the abolition of the most dangerous grade crossings over the primary highway system of Pennsylvania, made by the Public Service Commission but not carried out, owing to the war, are to be taken up again this year. There are more than 10,000 grade crossings in the State, a considerable number of which are deemed dangerous.

Car Driven by "Blind" Man

The owner of this Saxon car sells window blinds. When he stops his car on the street he pulls a window blind back of windshield which says, "This car driven by a Blind Man." Crowds of curious persons collect around the car expecting to really see a blind man driving the car, and inquire for the blind man that drives the car.